OPERATION AND SERVICE MANUAL
FOR
RF UNIT

MODELS 231A, 232A, 233A
234A, 235A, 238A, 238B, 242A

WEINSCHEL ENGINEERING

GAITHERSBURG, MARYLAND

OPERATION AND SERVICE MANUAL
FOR
RF UNIT

MODELS 231A, 232A, 233A
234A, 235A, 238A, 238B, 242A

OCTOBER 1971

©
WEINSCHEL ENGINEERING CO.
GAITHERSBERG, MARYLAND
1971

IM88(MP)-10/71

WARRANTY
by
WEINSCHEL ENGINEERING CO., INC

WEINSCHEL ENGINEERING COMPANY, INC., warrants each instrument of its manufacture to be free from defects in material and workmanship. WEINSCHEL ENGINEERING'S obligation under this warranty is limited to servicing or adjusting any instrument returned to its factory for that purpose, and to make good at its factory any part or parts thereof except transistors, fuses, batteries, and tubes (exception is microwave oscillator, see its warranty at rear of manual). This warranty period is limited to one year after delivery to the original purchaser, and to equipment which is returned by the original purchaser, to WEINSCHEL ENGINEERING with transportation charges prepaid and which, upon its examination, shall be disclosed to have been defective or to have failed in normal service. All warranty returns must first be authorized by WEINSCHEL ENGINEERING or its authorized sales representatives.

WEINSCHEL ENGINEERING reserves the right to make changes in design at any time without incurring any obligation to install such changes on units previously sold.

THIS IS WEINSCHEL ENGINEERING'S SOLE WARRANTY WITH RESPECT TO THE GOODS. WEINSCHEL ENGINEERING MAKES NO OTHER WARRANTY OF ANY KIND WHATEVER, EXPRESS OR IMPLIED, AND MAKES NO IMPLIED WARRANTIES OF MERCHANTABILITY OR SUCH THAT EXTEND BEYOND THE DESCRIPTION ON THE FACE HEREOF.

TABLE OF CONTENTS

Section		Page
1-0	GENERAL	1-1
1-1	Description	1-1
2-0	SPECIFICATIONS	2-1
2-1	Series 230A RF UNITS	2-1
3-0	INSTALLATION	3-1
3-1	Inspection	3-1
3-2	Installation in 230A Sweep Oscillator Mainframe	3-1
3-3	Repacking for Shipping	3-1
4-0	OPERATION	4-1
4-1	Introduction	4-1
4-2	Controls, Inputs and Outputs	4-1
4-3	FM Input	4-1
4-4	Frequency Range Selector	4-1
4-5	Signal Generator RF Level Control	4-1
4-6	Crystal Calibrator	4-1
5-0	PRINCIPLES OF OPERATION	5-1
5-1	RF Oscillator	5-1
5-2	Bias Supply	5-1
5-3	Tuning Supply	5-1
5-4	Yig Tuning Supply	5-1
5-5	Varactor Tuning Supply	5-5
5-6	FM Input	5-5
5-7	Leveling	5-7
5- 8	Heterodyne RF Unit	5-7
6- 0	MAINTENANCE	6-1
6- 1	Performance Tests	6-1
6- 2	Spurious Signals	6-1
6- 3	Frequency Stability	6-1
6- 4	VS 10dB Change in Power	6-1
6- 5	VS 3:1 Load VSWR	6-3
6- 6	VS ±10% Line Change	6-3
6- 7	Frequency Modulation	6-4
6- 8	Remote Tuning	6-4
6- 9	Pulse Input	6-4
6-10	Remote Level	6-4
6-11	Calibration Procedures	6-4
6-12	Frequency Adjustment	6-6
6-13	Yig Tuning Supply	6-6
6-14	Varactor Tuning Supply	6-6
6-15	Leveler	6-6
6-16	Servicing	6-6
6-17	Major Repair	6-7
7- 0	REPLACEABLE PARTS	7-1
7- 1	Introduction	7-1
7- 2	Reference Designations and Abbreviations	7-1
7- 3	Ordering Information	7-1
7- 4	Parts Lists and Cross Reference Table	7-1
8- 0	ASSEMBLY DRAWINGS AND SCHEMATICS	8-0

LIST OF TABLES

Table		Page
6-1	Test Equipment for Performance Checks	6- 2
6-2	Test Equipment for Calibration	6- 2
6-3	Trouble shooting Symptoms	6-10
6-4	Trouble shooting the Bias Supply (Positive)	6-11
6-5	Trouble shooting the Bias Supply (Negative)	6-14
6-6	Troubleshooting the Yig Supply	6-17
6-7	Trouble shooting the Varactor Supply	6-19
6-8	Trouble shooting the Leveler	6-21
7-1	Reference Designations and Abbreviations	7- 2
7-2	Assembly/Model Cross Reference	7- 3
7-3	Frequency Scale Parts Numbers	7- 4
7-4/ 7-34	Detailed Parts List of Major Assemblies	7-5/ 7-53
8-1	Graphic Symbols	8- 3

LIST OF ILLUSTRATIONS

Figure		Page
1-1	RF Unit	1-1
1-2	230A Sweep Oscillator with RF Unit installed	1-2
5-1	Bias Supply Block Diagram	5-1
5-2	General Block Diagram	5-3
5-3	YIG Tuning Supply Block Diagram	5-5
5-4	Varactor Tuning Supply Block Diagram	5-6
5-5	Leveling System Block Diagram	5-8
5-6	Heterodyne Unit Block Diagram	5-9
6-1	Frequency Stability vs RF Power Level Setup	6-1
6-2	Frequency Stability vs Load VSWR Setup	6-3
6-3	Frequency Stability vs Line Setup	6-3
6-4	Frequency Modulation Setup	6-4
6-5	Remote Tuning Setup	6-5
6-6	Pulse Modulation Setup	6- 5
6-7	Remote Leveling Setup	6- 5
6-8	Bias and Tuning Supply Connection Terminals	6- 8
6-9	Bias and Tuning Supply Voltages	6- 9
8-1	Assembly Location	8- 1
8-2	Schematic - RF Unit	8- 3
8-3	Schematic - Leveler Type A	8- 4
8-4	Schematic - Leveler Type B	8- 5
8-5	Schematic - Tuning and Bias Supply 231A, 238A, 238B	8- 6
8-6	Schematic - Tuning and Bias Supply 232A and 242A	8- 7
8-7	Schematic - Tuning and Bias Supply 234A(WJ) and 235A(WJ)	8- 8
8-8	Schematic - Heterodyne RF Unit 238A and 238B	8- 9
8-9	Schematic - Tuning and Bias Supply 234A(VA) and 235A(VA)	8-10

SECTION 1-0

GENERAL INFORMATION

1-1. DESCRIPTION. The RF Unit is designed to be used in conjunction with a Micro-Power 230A SWEEP OSCILLATOR. When the RF unit is plugged into the 230A the performance will be as specified in Section 2-0. See both this manual and the instruction Manual for the 230A SWEEP OSCILLATOR for complete information.

A typical RF unit is illustrated in Figure 1-1. An RF UNIT installed in the 230A SWEEP OSCILLATOR is shown in Figure 1-2.

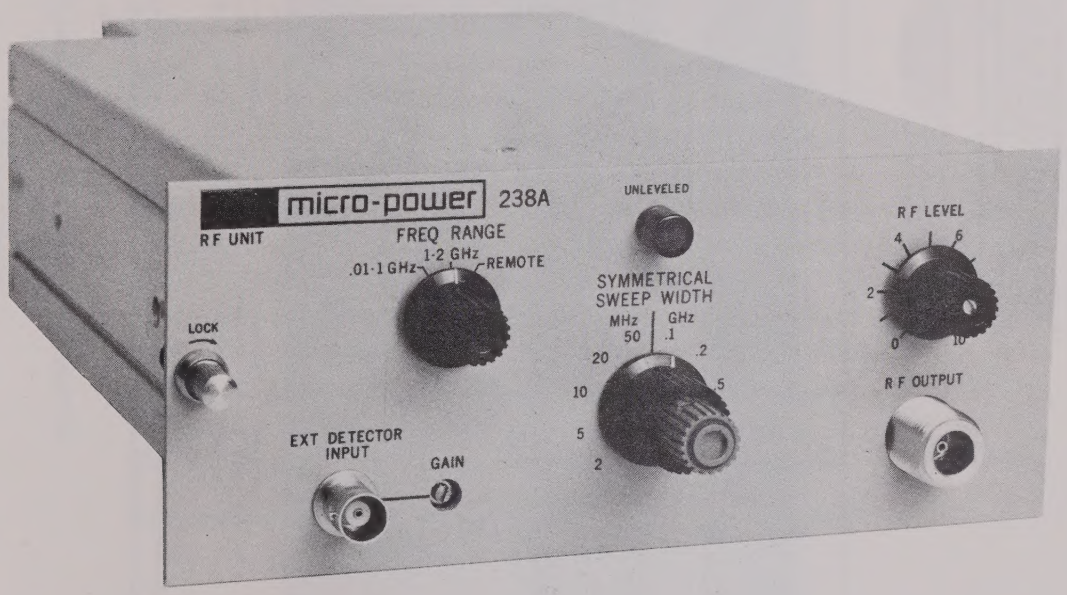


FIGURE 1-1. RF UNIT FOR MODEL 230A SWEEP OSCILLATOR

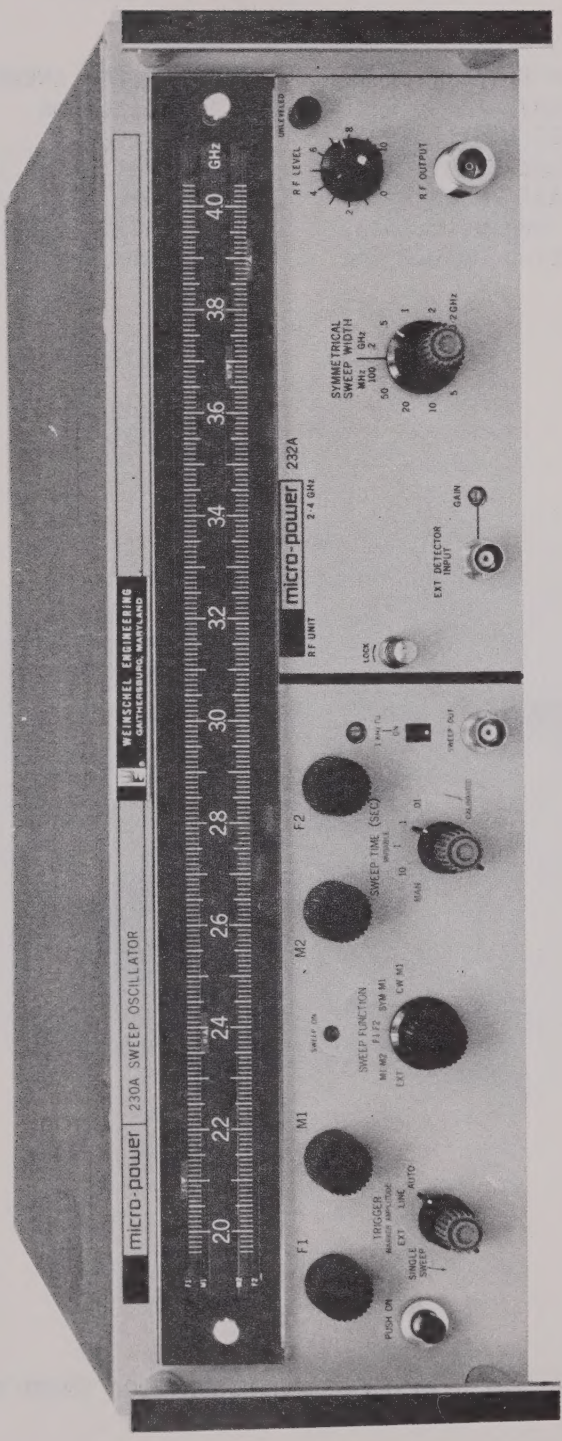


FIGURE 1-2. 230A SWEEP OSCILLATOR WITH RF UNIT INSTALLED

SECTION 2-0

SPECIFICATIONS

Model 230 Series RF Units
(Installed in Model 230A Sweep Oscillator Mainframe)

RF UNIT MODEL NO.	231A	231A-3[1]	232A	233A[8]	234A	235A[4]	238A[5]	242A
FREQUENCY								
Range:	1.0-2.0 GHz	1.0-2.0 GHz	2.0-4.0 GHz	4.0-8.0 GHz	8.0-12.4 GHz	12.4-18.0 GHz	0.01-1.0 GHz | 1.0-2.0 GHz	1.7-4.2 GHz
Accuracy (at 25°C):	±10 MHz	±10 MHz	±10 MHz	±20 MHz	±40 MHz	±60 MHz	±10 MHz	±10 MHz
Stability:								
With Temperature:	0.05%/°C	0.05%/°C	0.05%/°C	0.05%/°C	0.05%/°C	0.05%/°C	0.05%/°C	0.05%/°C
With 10 dB Power Level Change:	10 MHz	2 MHz	1 MHz	2 MHz	1 MHz	2 MHz	2 MHz | 10 MHz	1 MHz
With 10% Line Voltage Change:	10 kHz	10 kHz	20 kHz	20 kHz	40 kHz	60 kHz	10 kHz	20 kHz
With 3:1 Load VSWR, All Phases:	30 MHz	5 MHz	1 MHz	2 MHz	1MHz	2 MHz	100 kHz | 30 MHz	1 MHz
POWER OUTPUT								
Maximum Leveled Power (at 25°C):								
Internal[2]:	20 mW	40 mW	15 mW	6 mW	5mW		20 mW	10 mW
External[3]:	25 mW	50 mW	20 mW	8 mW	6 mW	4 mW	20 mW | 25 mW	15 mW
Power Variation, Internal Leveling[2]:	±0.5 dB	±0.5 dB	±0.5 dB	±0.5 dB	±0.7 dB		±0.6 dB | ±0.5 dB	±0.5 dB
Peak Residual FM:	4 kHz	4 kHz	8 kHz	16 kHz	20 kHz	30 kHz	4 kHz	8 kHz
Peak Residual AM:	>50 dB	>50 dB	>50 dB	>50 dB	>50 dB	>50 dB	>50 dB	>50 dB
MODULATION								
FM Input Range:	dc-5 MHz	dc-5 MHz	dc-100 kHz	dc-100 kHz	dc-100 kHz	dc-100 kHz	dc-5 MHz	dc-100 kHz
NET WEIGHT	5 lb.	6.5 lb.	5 lb.	5 lb.	5 lb.	5.5 lb.	8 lb.	5 lb.

NOTES:
1. Same as Model 231A, but with 20 dB isolator.
2. Internal Leveling (Option -1) includes build-in directional coupler.
3. Power variation with external directional detector for all RF Units is ±0.1 dB, plus directional detector error.
4. Model 235A furnished with Type SMA output connector. All other models furnished with Type N.
5. Available as Model 238B which includes calibrated attenuator providing leveled absolute power over +13 to -90 dBm range. Frequency response is ±1 dB over operating band. Accuracy at 1 GHz is ±0.5 dB ±2% of RF level in dB from 0 dBm to -90 dBm.
6. Option -2. Rear panel mounted Type N connector for RF output available on all units.
7. Other frequency ranges and higher output power available upon special request.
8. Tentative specifications.
9. SPURIOUS SIGNALS: Standard units 40 dB below RF output. Heterodyne Units 30 dB below RF output. Second harmonic 20 dB below RF output.

SECTION 3-0

INSTALLATION

3-1. INSPECTION. Carefully inspect RF UNIT immediately upon receipt. Do not discard packing material until satisfied that equipment is undamaged and operating properly. Should shipping damage be found, report claims to carrier immediately.

The equipment may be tested, if desired, for conformance with the specifications of section 2-0 of this manual and of the 230A SWEEP OSCILLATOR manual. Follow the procedures given in Section 6-1 of this manual.

3-2. INSTALLATION IN 230A SWEEP OSCILLATOR MAINFRAME. If another RF UNIT is to be removed first, proceed as follows:

(1) Turn off power (eg. via the PUSH ON switch).

(2) Unfasten and remove the dial scale from the mainframe by loosening the two knurled screws.

(3) Rotate the Knurled LOCK Knob on the RF UNIT front panel counterclockwise. Draw the RF UNIT out of the mainframe by pulling on the LOCK thumbscrew.

Then install the new RF UNIT as follows:

(1) Place the new dial scale (furnished with RF UNIT) on the mainframe and fasten it by its two thumbscrews.

(2) Rotate the knurled LOCK knob on the RF UNIT front panel counterclockwise. Insert the RF UNIT into its compartment within the mainframe until its front panel is flush with the mainframe panel.

(3) Rotate the knurled LOCK knob fully clockwise.

(4) Power may now be turned on. The equipment is ready for operation immediately.

3-3. REPACKING FOR SHIPMENT. Follow procedure of Section 3-4 of the 230A SWEEP OSCILLATOR Instruction Manual.

3-4. The warranty for the microwave oscillator is given on a separate form at the rear of this manual.

SECTION 4-0

OPERATION

CAUTION: The RF OUTPUT power level exceeds the rating of many standard detectors. The operator should therefor insert appropriate attenuation when used with thermistor mounts, bolometers or low power diode detectors to avoid burnout.

4-1. INTRODUCTION. The Series 230A RF UNITS are all solid state RF signal sources for CW and swept measurements. It is designed for use in the 230A SWEEP OSCILLATOR Mainframe, whose Instruction Manual covers the mainframe itself, the RF UNIT with mainframe, and certain aspects of the RF UNIT. The following paragraphs describe operation of the RF UNIT not covered in the 230A SWEEP OSCILLATOR instruction Manual.

4-2. CONTROLS, INPUTS AND OUTPUT. For standard units see Section 4-2 of the 230A SWEEP OSCILLATOR instruction Manual.

4-3. FM INPUT. This input can be used to direct couple wide band signals to the RF oscillator. This permits phase locking to an external frequency reference using a suitable synchronizer, stabilizer or "lock box". The upper frequency response limit is given in Section 2-0. Positive going voltage causes RF frequency to increase; negative to decrease. Modulation sensitivity is 20 MHz/volt for YIG tuned units. Varactor tuned units exhibit greater sensitivity at the low end of their frequency range; lower sensitivity at the high end. Deviation up to the band edge is permissible. YIG tuned units maintain a constant modulation sensitivity.

4-4. FREQUENCY RANGE SELECTOR. RF UNITS which provide more than one frequency range in a single plug-in unit include a front panel FREQUENCY RANGE selector switch. Its Dial Scale calibrations are direct reading for each band without computation.

4-5. SIGNAL GENERATOR RF LEVEL CONTROL. Signal generator RF UNITS have coaxial calibrated RF LEVEL controls. Both knobs are calibrated directly in dBm. When internal leveling is employed the power provided at the RF OUTPUT connector is the algebraic sum of the two readings. Interpretation is simplified by color coding +dBm readings in red, while -dBm values are in black. The calibrating adjustment trimmer is located inside the RF UNIT.

4-6. CRYSTAL CALIBRATOR. RF UNITS featuring crystal calibration provide a rear panel EXT CAL INPUT for operator introduction of standard frequency. Built-in crystal controlled calibration frequencies are operated via the front panel XTAL CALIB on off switch, marked with the applicable frequency. Example: 5 MHz XTAL CALIB.

The RF UNIT contains the electrically tunable RF OSCILLATOR with circuits for controlling its frequency and output amplitude. The General Block Diagram of Figure 5-2 illustrates a typical RF UNIT together with the major functions of the 230A SWEEP OSCILLATOR mainframe. See Section 5-0 of the mainframe Instruction Manual for its principles of operation. The following paragraphs discuss aspects unique to the RF UNIT itself.

5-1. RF OSCILLATOR. RF power originates in the oscillator. The oscillator requires bias power to energize it and tuning signal to set its RF frequency. Oscillators used in the Series 230A RF Units include transistor and microwave bulk effect diodes, usually tuned by voltage variable capacitors (varactors) or by magnetically tuned resonators (YIG).

5-2. BIAS SUPPLY. The bias supply, illustrated in Fig. 5-1, consists of an unregulated DC input from the mainframe, the series pass regulating transistor with its driver and current limiter located in the mainframe for positive bias, or in the RF UNIT for negative bias, and a difference amplifier in the RF UNIT, which continuously compares the regulated bias with the reference voltage supplied from the mainframe. A fuse in the RF UNIT protects against failures which might disable the electronic current limit feature.
The overvoltage protective crowbar circuit places a short circuit across the oscillator bias terminals in the event of even momentary overvoltage. Primary power must be interrupted to reset the crowbar. A zener diode across the oscillator protects it from reverse voltage and from loss of protection should the crowbar fail.

5-3. TUNING SUPPLY. Tuning supply provides either tuning voltage or tuning current, as appropriate to the RF oscillator used.

5-4. YIG TUNING SUPPLY. The requirement on the YIG Supply is that current through its load, the YIG tuning coil, be proportional to the tuning voltage command input. This is accomplished by placing a resistor in series with the coil. Its IR drop is a voltage proportional to YIG tuning coil current. By comparing this voltage drop with its tuning voltage command input, the supply regulates the voltage drop across the sensing resistor, hence also regulates the YIG tuning coil current.

As shown in Fig. 5-3, the YIG tuning supply consists of an unregulated DC input from the mainframe, series pass transistor driven by an error amplifier, sensing resistors and a response time circuit. The latter introduces lag in the supply (by a lead in the negative feedback path) which attenuates response to input noise and ripple, when activated in either the CW mode or when the rear panel SWEEP RESPONSE TIME selector is set to SLOW.

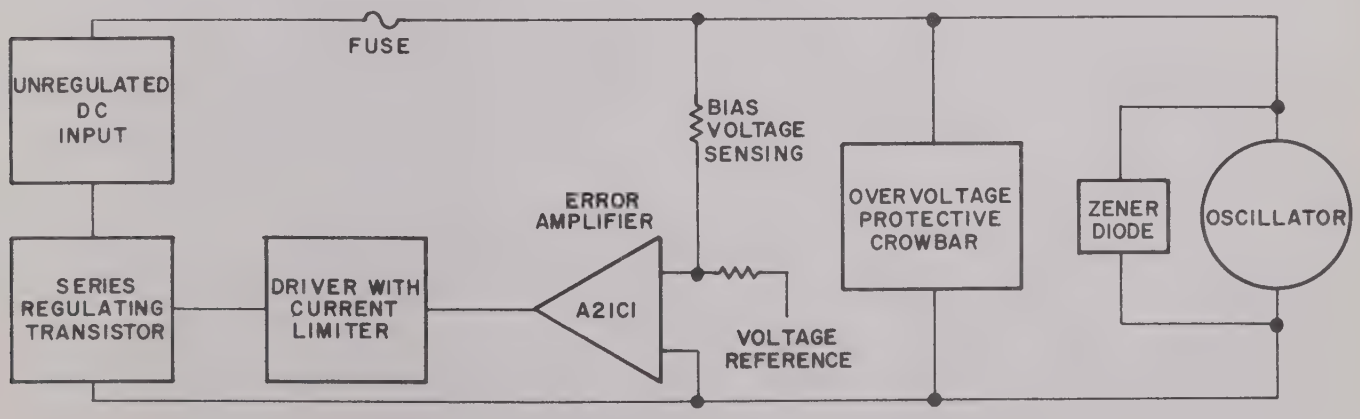
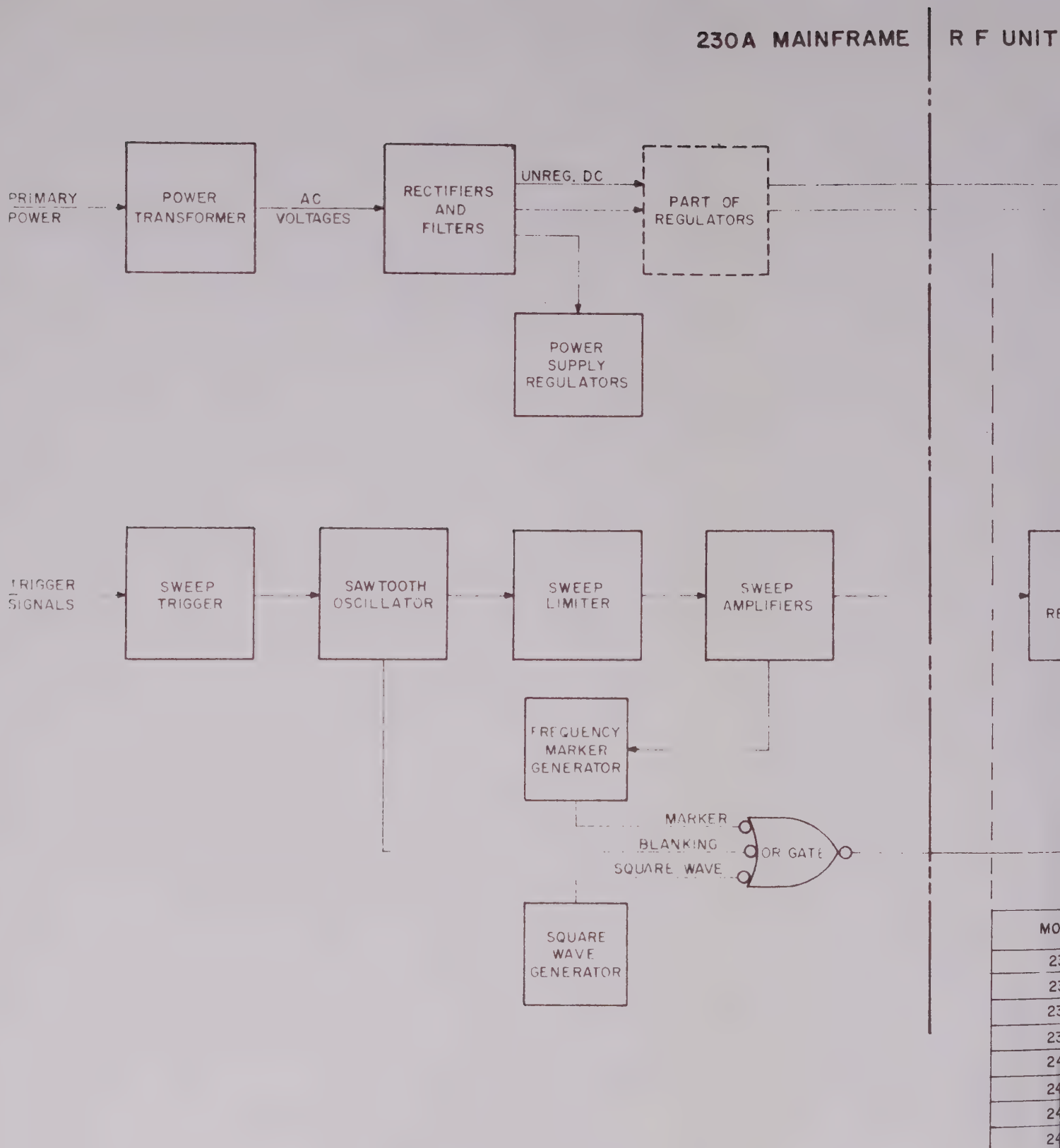
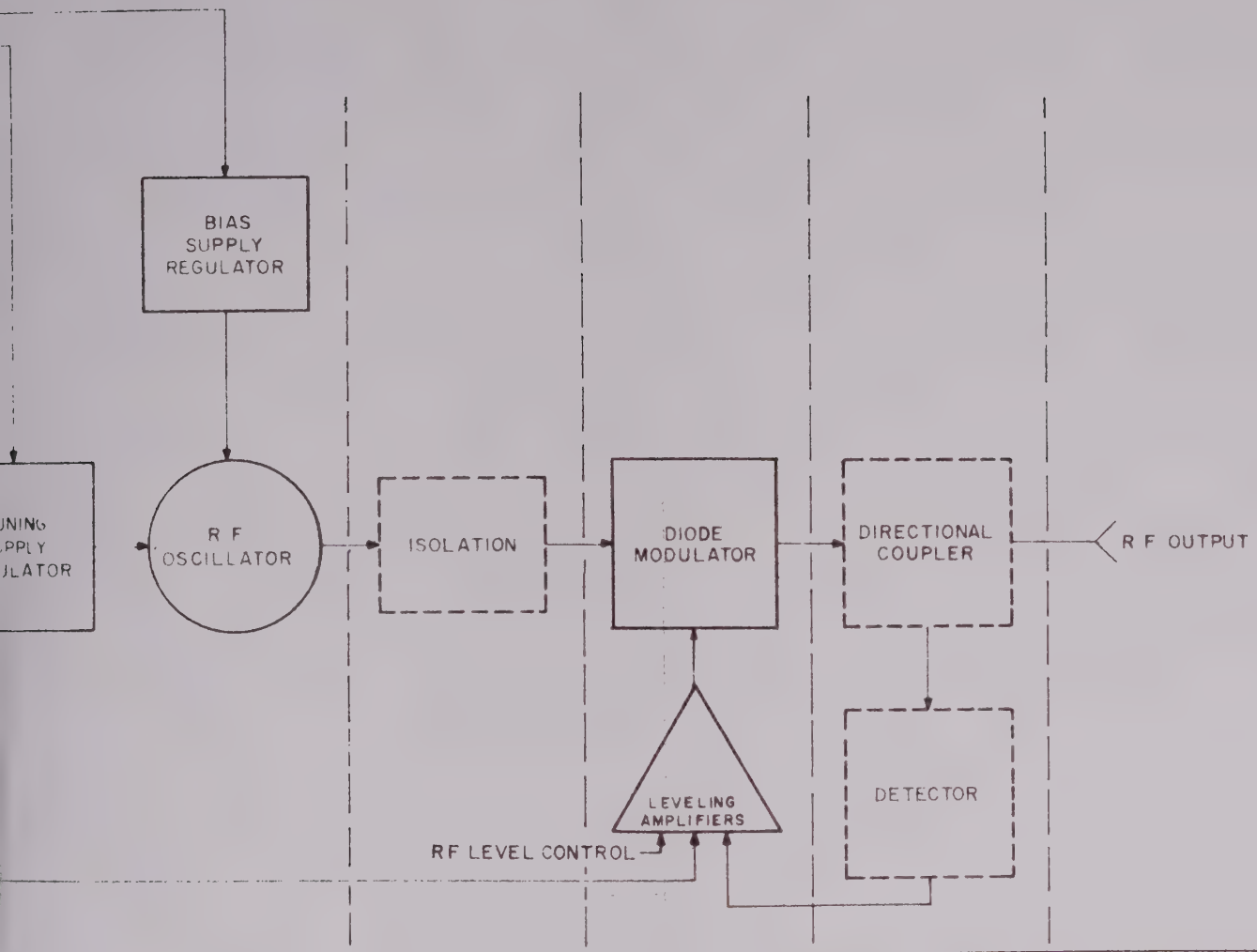


FIGURE 5-1


230A MAINFRAME
R F UNIT
PRIMARY POWER
POWER TRANSFORMER
AC VOLTAGES
RECTIFIERS AND FILTERS
UNREG. DC
PART OF REGULATORS
POWER SUPPLY REGULATORS
TRIGGER SIGNALS
SWEEP TRIGGER
SAWTOOTH OSCILLATOR
SWEEP LIMITER
SWEEP AMPLIFIERS
FREQUENCY MARKER GENERATOR
MARKER
BLANKING
SQUARE WAVE
OR GATE
SQUARE WAVE GENERATOR



EL	FREQUENCY (GHz)	INTERNAL ISOLATOR		INTERNAL LEVELING	REAR PANEL OUTPUT
A	1-2	-3	V	-1	-2
2A	2-4	NA	V	-1	-2
4A	8-12.4	V	V	-1	-2
5A	12.4-18	V	V	-1	-2
1A	1.4-2.5	NA	V	-1	-2
2A	1.7-4.2	NA	V	-1	-2
3A	3.6-4.3	NA	V	-1	-2
4A	5.85-6.45	NA	V	-1	-2

FIG. 5-2

GENERAL BLOCK DIAGRAM

MODEL 230A WITH RF UNIT

LEGEND

V = INCLUDED

-1, -2, -3 } OPTION NUMBERS

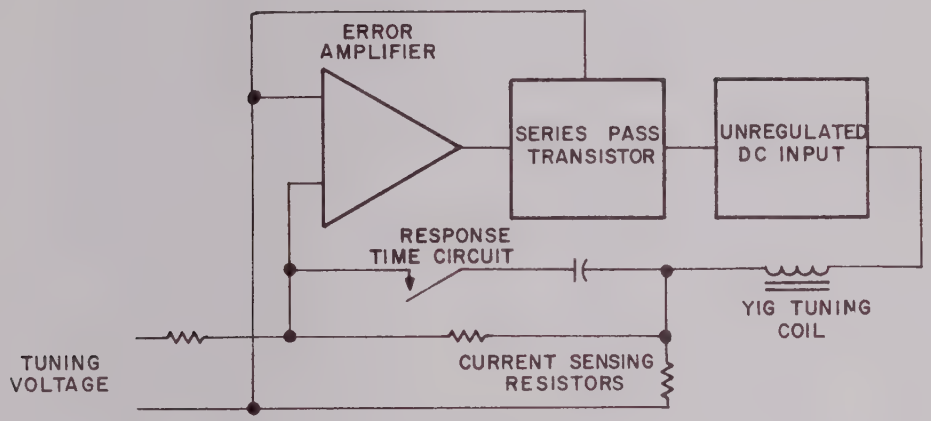


FIGURE 5-3

5-5. VARACTOR TUNING SUPPLY. Fig. 5-4 shows the block diagram of the Varactor type Tuning Supply, used for voltage tuned RF oscillators. The supply consists of a 200V UNREGULATED DC INPUT with PREREGULATING SERIES PASS TRANSISTOR, both located in the mainframe, and ERROR AMPLIFIER with PASS TRANSISTORS connected in a closed loop feedback system. The reference for this supply is the tuning voltage command input, provided from the mainframe.

Since the RF frequency vs varactor voltage is usually not linear, a linearizing DIODE SHAPING NETWORK is incorporated in the negative feedback path of the varactor tuning supply to provide a linear relationship between tuning voltage command input and the frequency produced by the RF oscillator. This linearizing network functions as follows:

A portion of the output voltage appears across the DIODE NETWORK and as the output voltage increases more diodes become forward biased. As each additional diode conducts the incremental reduction in feedback increases the output vs input slope. By suitable choice of resistors associated with the diodes, the output vs command input voltage curve can be shaped to provide the desired linear relationship between command input and RF frequency.

The response time circuit introduces a time lag in the supply (by a lead in the negative feedback path) which attenuates response to any input noise and ripple, when activated in either the CW mode or when the rear panel SWEEP RESPONSE TIME selector is set to SLOW.

5-6. FM INPUT. Frequency modulation at a higher modulating frequency than the tuning supply can handle is provided via an alternate path to the RF oscillator.

The voltage variable capacitor used in a varactor tuned RF oscillator has two terminals. One is connected to the tuning supply; the other to the FM INPUT connector with suitable RF decoupling. Thus the potential difference across the varactor is the difference between the tuning supply output and the FM INPUT signals. Consequently the RF oscillator frequency is determined by the tuning supply setting, on which is superimposed the FM INPUT contribution.

YIG tuned RF oscillators are inherently limited in the upper modulating frequency to which the magnetic tuning core can respond. An auxilliary winding is used to perturb the YIG resonator magnetic field intensity via

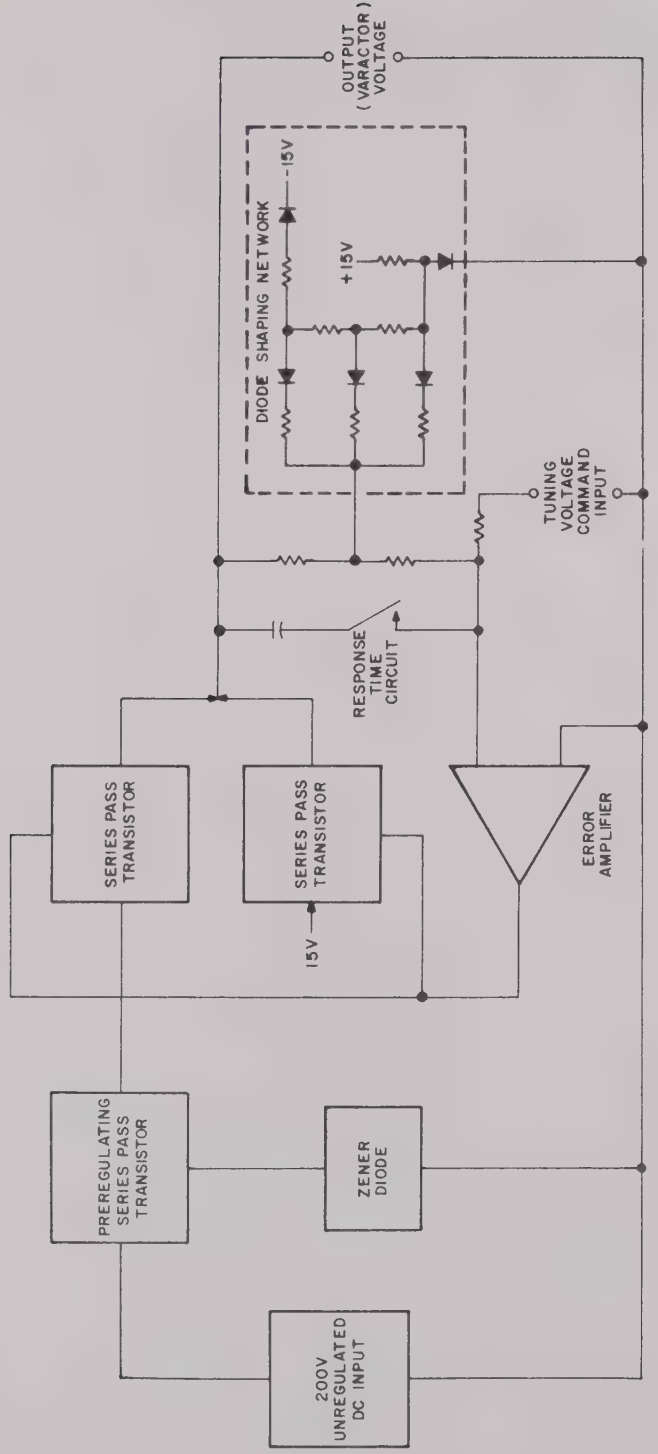


FIG. 5-4
VARACTOR TUNING SUPPLY
BLOCK DIAGRAM
RF UNIT

essentially air core coupling for wide frequency response. This auxiliary winding is driven by an FM AMPLIFIER in the RF UNIT, which is AC coupled to the FM INPUT connector. DC and low frequency modulation is summed into the main tuning supply via a direct coupled path from the FM INPUT. Thus the FM INPUT dynamic range for DC and low frequencies is sufficient to cover the entire range of the RF oscillator.

5-7. LEVELING. RF amplitude may be maintained constant across the frequency band by means of the closed loop leveling system, illustrated in Figure 5-5. The reference for this system is the DC voltage set by the RF LEVEL potentiometer. This is compared against the output of the DETECTOR, which converts the RF output sample from the DIRECTIONAL COUPLER to a negative feedback DC signal. Any error signal is amplified and used to drive the DIODE MODULATOR, which attenuates the RF OSCILLATOR output to the required amplitude.

The RF LEVEL potentiometer voltage is modulated by markers, square wave and blanking waveforms. The internally generated frequency marker can be used to decrease the RF amplitude, and appears as a sharp dip in power on the swept display. When the internal 1 KHz ⊓⊔ is ON, the RF LEVEL potentiometer DC voltage is removed on negative half cycles of the square wave. This appears on the display as removal of RF output during that half of the square wave. The blanking signal can also be introduced to remove RF output from the display during retrace. This provides a "zero" base line reference on the display.

When the DETECTOR employed is a power meter (with thermistor or bolometer head) the LEVELING MODE selector introduces a negative feedback stabilizing time constant in the error amplifier. The response time is deliberately limited to accommodate the power meter time constant. This means that SWEEP TIME (SEC) selection is limited to the region between 10 and 100 seconds. Modulation of RF markers and square wave is then introduced after the slow responding amplifier. The response time of the leveling loop is too long to follow 1 KHz square wave modulation, so the average power will be regulated. Since the duty factor is 50%, the peak power with square wave modulation will be twice the average power. RF DURING RETRACE should be left ON for best results when power meter leveling.

5-8. HETERODYNE RF UNIT. The arrangement of components for heterodyne operation is shown in block diagram form in Fig. 5-6. The RF from a fixed and from a swept oscillator are combined in a mixer. The difference frequency is amplified and provides the RF output. Leveling is applied only to the fixed frequency oscillator, including RF LEVEL adjustment and modulation.

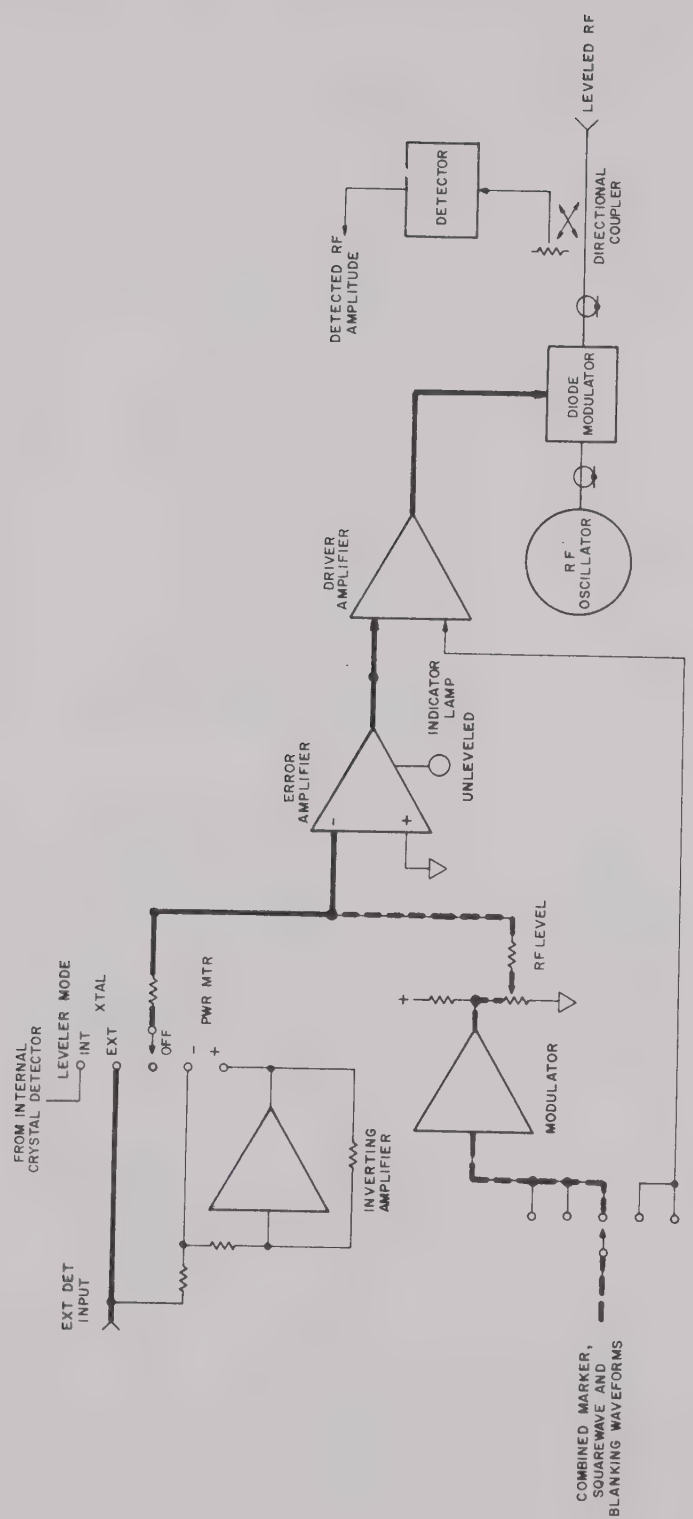


FIG 5-5
LEVELING SYSTEM
BLOCK DIAGRAM
RF UNIT

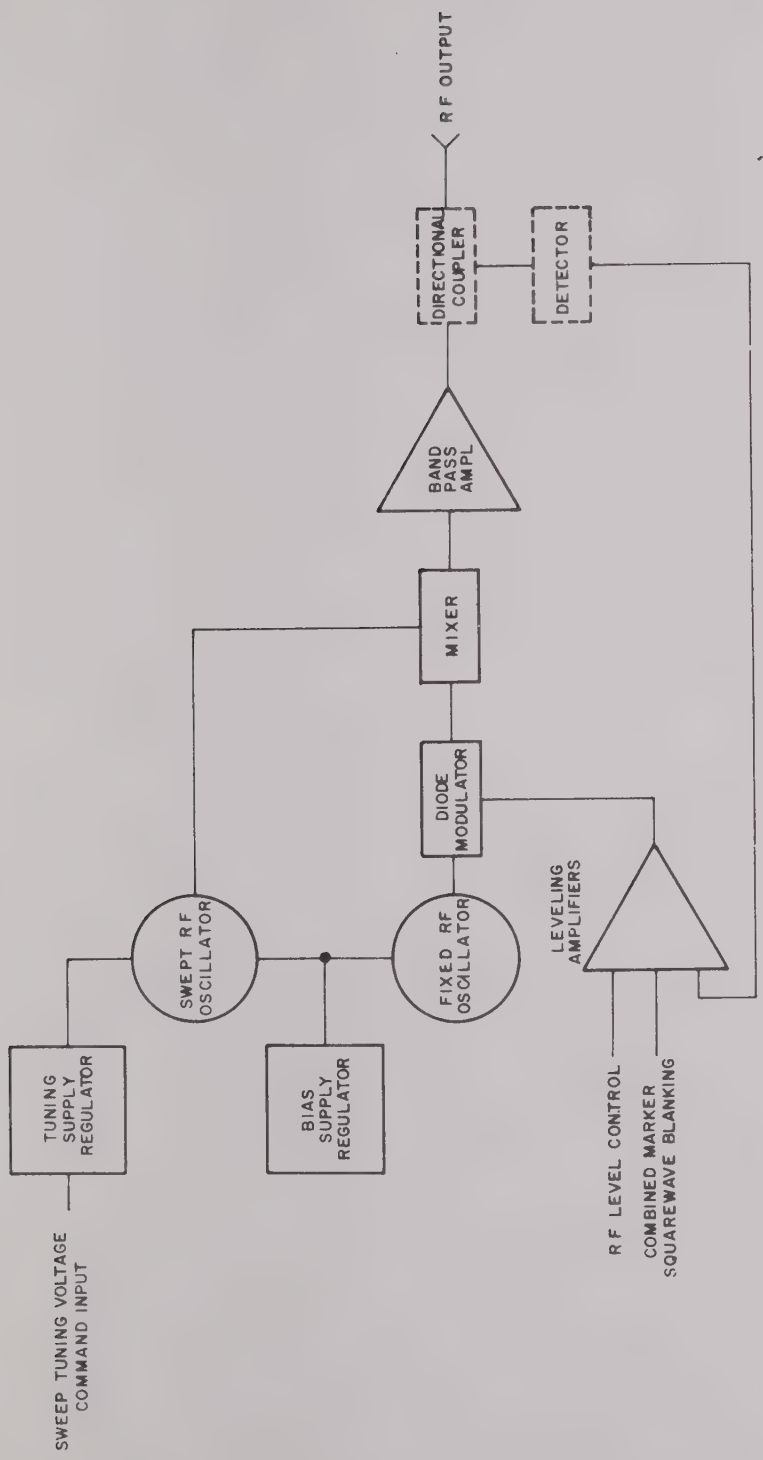


FIG.5-6
HETERODYNE RF UNIT
BLOCK DIAGRAM
RF UNIT

SECTION 6-0

MAINTENANCE

6-1. PERFORMANCE TESTS. Tests normally suggested to check the instrument against its specifications for incoming inspection, periodic maintenance and after servicing are given in Sections 6-2 through 6-14 of the 230A SWEEP OSCILLATOR MANUAL. In addition, the following sections of this manual detail further performance tests which may be desirable. Table 6-1 lists the test equipment required.

6-2. SPURIOUS SIGNALS

a. Connect the RF OUTPUT to the spectrum analyzer input. A 10 dB attenuator pad should be used to avoid burn-out of the spectrum analyzer input.

b. Set the SWEEP OSCILLATOR controls as follows:

M1	midband (or any specific frequency to be investigated)
SWEEP FUNCTION	CW M1
1KHz ⊓⊔	off
RF LEVEL	maximum clockwise

c. Observe the amplitude at the desired RF frequency, and at any spurious and harmonic frequency of interest. Follow the manufacturer's directions to distinguish spurious responses of the analyzer from those of the SWEEP OSCILLATOR.

d. The unwanted responses should conform with Section 2-0 of this instruction manual.

6-3. FREQUENCY STABILITY. Stability tests should be conducted in a temperature stable location free from drafts. Warm-up of at least 15 minutes should be completed prior to measurements.

6-4. VS 10 dB CHANGE IN POWER.

a. Connect the equipment per Fig. 6-1. A high resolution frequency meter may be substituted for the spectrum analyzer.

b. Set the SWEEP OSCILLATOR controls as follows:

M1	midband (or any specific frequency to be investigated)
SWEEP FUNCTION	CW M1
1 KHz ⊓⊔	off
RF LEVEL	maximum clockwise
LEVELER MODE	INT or OFF

c. Observe the power meter reading in dB, and the RF frequency indication. Reduce the power by 10 dB via the RF LEVEL control.

d. Note the change in frequency indication. It should not exceed the specification of Section 2-1.

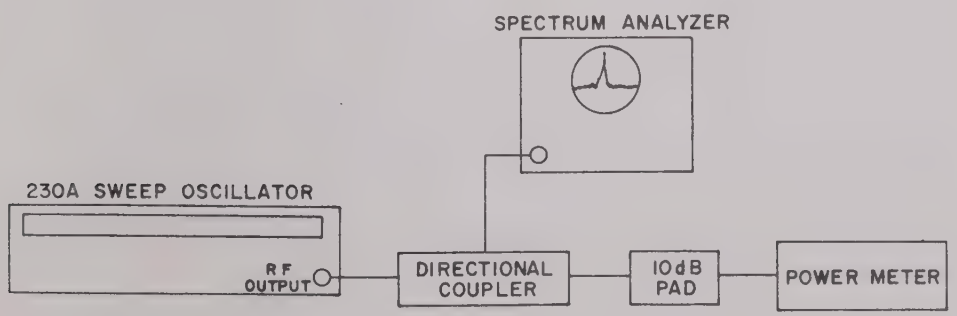


FIGURE 6-1

TABLE 6-1

TEST EQUIPMENT
FOR PERFORMANCE TESTING

Note: See also Table 6-1 of 230A SWEEP OSCILLATOR Instruction Manual

TITLE	REQUIREMENTS	SUGGESTED MFR. AND MODEL NO.
Adjustable Length Line	0.2 dB max. Insertion Loss. 12 inch Travel	Microlab/FXR SR-05N
Short Circuit Termination	Less than 0.5 ohm	Microlab/FXR TR-5MN
Spectrum Analyzer		HP Model 8551B

TABLE 6-2

TEST EQUIPMENT
FOR CALIBRATION

See Table 6-2 of 230A SWEEP OSCILLATOR Instruction Manual.

6-5. VS 3:1 LOAD VSWR

a. Connect the equipment per Figure 6-2. The combined insertion loss of the coupler and pad in the main line is to be 3 dB. Thus a 3 dB coupler and no pad or a 10 dB coupler and a 2½ dB pad are suitable combinations.

b. Set the SWEEP OSCILLATOR controls as in Section 6-4 above.

c. Observe the peak to peak change in frequency indication as the adjustable length line is varied over at least ½ wavelength. Divide by two.

d. The maximum allowable result is given in Section 2-1.

6-6. VS ±10% LINE CHANGE

a. Connect equipment per Figure 6-3.

b. Set SWEEP OSCILLATOR controls per 6-4 above.

c. Adjust the AC line input over the range 105 to 125 volts RMS (or 210 to 250 if applicable). Note the peak to peak change in frequency indication. Divide by two.

d. The maximum allowable result is given in Section 2-1.

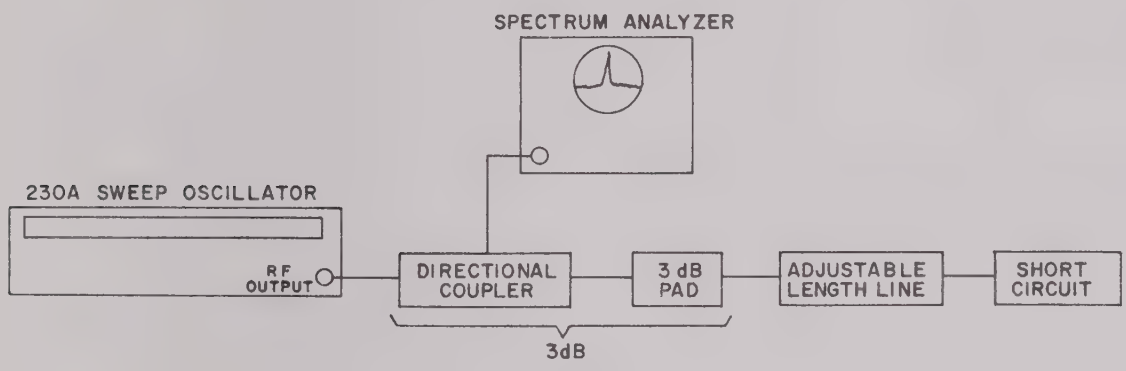


FIGURE 6-2

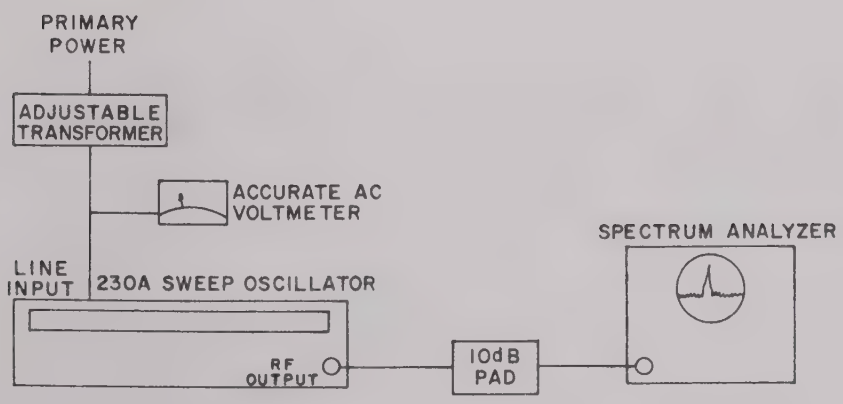


FIGURE 6-3

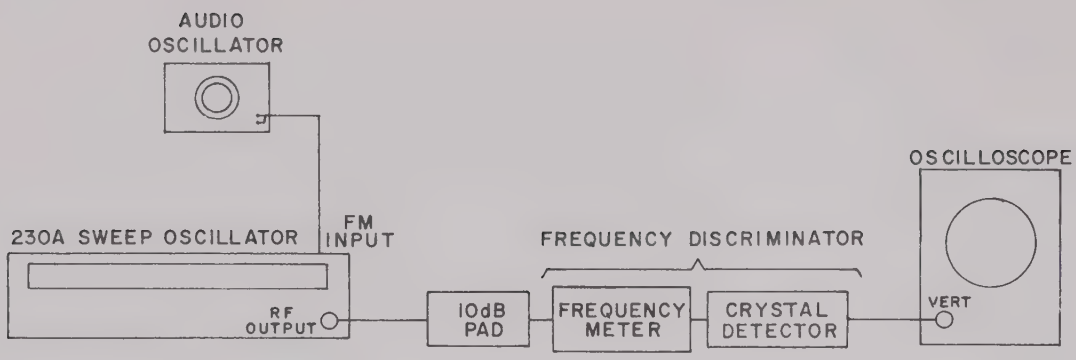


FIGURE 6-4

6-7. FREQUENCY MODULATION.

a. Connect equipment per Fig. 6-4.
b. Set the Sweep Oscillator controls as follows:

SWEEP FUNCTION	SYM M1
SWEEP TIME	MAN
SYMMETRICAL SWEEP WIDTH	MAX CCW
M1	CENTER OF RANGE

c. Set the audio oscillator output for approx. 50 millivolts peak to peak.
d. Observe demodulated FM on oscilloscope. Measure the demodulated FM to be continuous from DC to the specific FM input frequency rate in Section 2.

6-8. REMOTE TUNING

a. Connect equipment as in Figure 6-5.
b. Set the SWEEP OSCILLATOR controls as in Section 6-2(b).
c. Remove the shorting link from the RF UNIT rear panel terminal strip A7TB3 terminals 2 and 3. Apply one volt DC between terminals 2 and 3 where terminal 3 is at ground potential.
d. The change in RF frequency should be 1/10 of full band of the RF Unit, increasing for positive input.
e. Replace the shorting link.

6-9. PULSE INPUT

a. Connect the equipment per Figure 6-6.
b. Set the SWEEP OSCILLATOR controls as follows:

M1	midband
SWEEP FUNCTION	CW M1
1 KHz ⊓	off
RF LEVEL	maximum counterclockwise
LEVELER MODE	OFF

c. Apply pulse amplitude sufficient to reach full RF output.
d. The required pulse amplitude should not exceed 10 volts. (It may be necessary to turn the RF LEVEL control slightly clockwise to achieve full RF output with a 10 volt input pulse.) The RF pulse rise and fall times should be less than 1 microsecond.

6-10. REMOTE LEVEL

a. Connect the equipment per Fig. 6-7. Remove shorting jumpers from RF UNIT rear terminal strip A7TB3 terminals 4 and 5 and from 6 and 7.
b. Set the SWEEP OSCILLATOR controls as follows:

F1	low end of scale
TRIGGER	LINE
SWEEP FUNCTION	F1-F2
SWEEP TIME(SEC)	.01
F2	high end of scale
1 KHz ⊓	OFF

c. Adjust the potentiometer. RF amplitude should be controllable from full output through leveled to minimum power output. Replace the jumpers when the remote level control is disconnected.

6-11. CALIBRATION PROCEDURES.
A calibrated 230A SWEEP OSCILLATOR mainframe is required for a calibration of the RF UNIT. Test equipment required for calibration is listed in Table 6-2.

Turn power off. Remove the top cover from

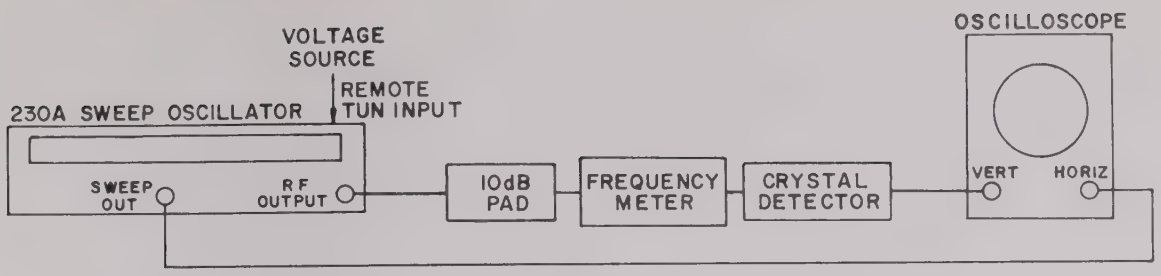


FIGURE 6-5

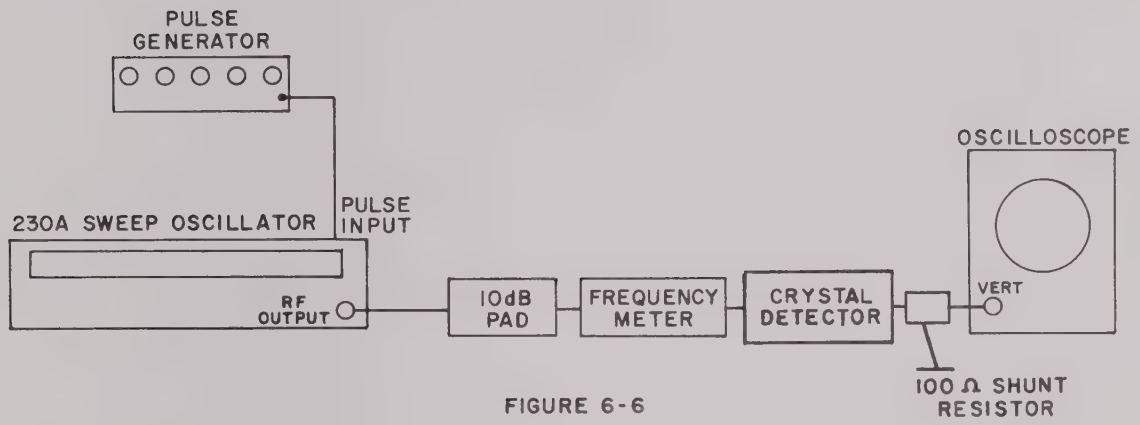


FIGURE 6-6

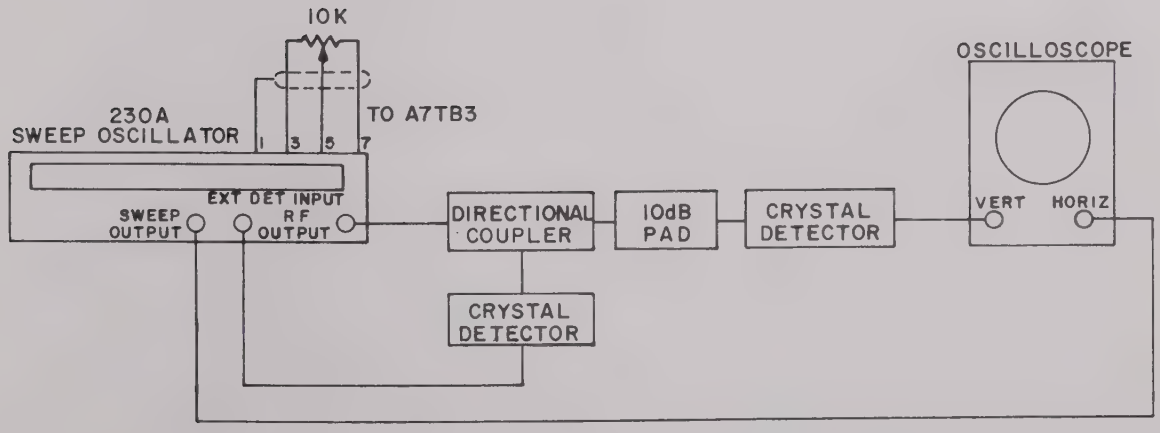


FIGURE 6-7

both the mainframe and the RF UNIT. Replace the RF UNIT in the mainframe, turn power on. Allow a 15 minute warm-up period before proceeding with calibration.

6-12. FREQUENCY ADJUSTMENT

a. Connect the equipment per Fig. 6-5. Do not apply voltage to the REMOTE TUN INPUT. Leave the shorting link in place on A7TB3, rear panel terminal strip of the RF UNIT, between terminals 2 and 3.

6-13. YIG TUNING SUPPLY.

a. Set the SWEEP OSCILLATOR controls as follows:

F1	low end of scale
M1	nominal low end of band exactly on scale division
M2	nominal high end of band, exactly on scale division
F2	high end of scale
TRIGGER	LINE
MARKER AMPLITUDE	as desired
SWEEP FUNCTION	F1-F2
SWEEP TIME (SEC)	.1
1 KHz ⊓⊔	off
RF LEVEL	maximum clockwise*
LEVELER MODE	OFF*
SWEEP RESPONSE TIME	NORMAL

*) If RF UNIT features Option -1 (internal leveling) set LEVELER MODE to INT and adjust RF LEVEL just counterclockwise enough so that RF amplitude is leveled across the nominal frequency band.

b. Set the frequency meter to the scale reading of M1. Adjust RF UNIT A2R54 to make the frequency meter dip and the marker dip coincide on the oscilloscope display. Set the frequency meter to the scale reading of M2. Adjust A2R12. Repeat until both frequencies are set within ¼ of the specification frequency accuracy tolerance.

6-14. VARACTOR TUNING SUPPLY

a. Connect the equipment per 6-12a.

b. Set the SWEEP OSCILLATOR controls as in 6-13A.

c. Set the frequency meter so that its dip on the oscilloscope display coincides with the M1 marker dip. Note its reading. Reset the M1 marker to other frequencies of interest (e.g. midband and the high end of the nominal band) and repeat.

Potentiometer A2R54 may be adjusted to shift the entire band either higher or lower in frequency.

6-15. LEVELER

a. Connect the equipment per Fig.6-6 with the frequency meter and Pulse Gen. omitted.

b. Set the SWEEP OSCILLATOR controls as follows:

MARKER AMPLITUDE	maximum counterclockwise
TRIGGER	LINE
SWEEP FUNCTION	F1-F2
SWEEP TIME (SEC)	.1
1 KHz ⊓⊔	off
LEVELER MODE	OFF
RF DURING RETRACE	OFF

c. Set zero adjust so that when the RF LEVEL control is fully counterclockwise the RF amplitude displayed just reaches the minimum.

d. Change LEVELER MODE to EXT XTAL. See that when the RF LEVEL control is rotated to its fully counterclockwise position the RF amplitude displayed reaches minimum. If not, reset A1R12 so that it does.

6-16. SERVICING. Removing the covers from the RF unit provides access to its interior. Its plug-in cards, whose functions are printed on the underside of the top cover, may be exchanged or checked.
With top and bottom covers removed from both the RF UNIT and the Mainframe the equipment may be operated normally, with access to its test points. When inserting an RF UNIT without covers into the Mainframe, guide it into place to properly engage the 36 pin connector.

6-17. MAJOR REPAIR - Preliminary Calibration.

The preliminary calibration procedure described below should be followed when repairs have been made on the chassis harness or if an RF Oscillator is replaced.

(1) Disconnect RF Oscillator. Remove wires at terminal board A7TB2. Terminal numbers are indicated in Fig. 6-8.

(2) Clean contact fingers of all P.C. boards.

(3) Plug RF unit into 230A mainframe with RF unit covers removed.

(4) BIAS SUPPLY

a. Connect a 1/2% accurate Voltmeter (Simpson Model 1700) between terminal A7TB2-5 and chassis ground, observing polarity (see Fig.6-9). Turn the power on and measure the voltage to be within 1% of the bias voltage specified in Fig.6-9. For the 234A/235A RF Unit, resistor A2R55 must be selected so that the bias voltage is within 1% of the value specified on the label of the RF oscillator. A typical value of A2R55 is 10K for a bias of 10 volts.

b. Check other voltages indicated in Fig. 6-9 for applicable RF unit.

(5) CROWBAR CIRCUIT

a. Turn power off, from Fig. 6-9 determine the required bias voltage and its polarity. Using an external variable voltage DC power supply capable of delivering the required bias voltage, connect one lead of the power supply in series with a 330 ohm, 2 Watt resistor to A7TB2-5 and other power supply lead to ground observing the specified polarity.

Connect a 1/2% accurate voltmeter between A7TB2-5 and chassis ground. With the AC power into 230A still off, set the voltage from external DC to be 5% above the bias voltage specified for the RF Oscillator. Select a value for A2R68 (typically 6.5K ohms for bias voltage of 20 volts) so that the crowbar circuit is actuated as measured by a low voltage reading on the voltmeter.

b. Recheck the crowbar setting by reducing the external DC voltage to zero and then increasing it and measuring the crowbar trip voltage to be between 4% and 5% above the specified bias voltage.

c. Turn power on and connect the oscilloscope input terminals across the bias supply output terminals A7TB2-5 and chassis ground. Place a short circuit across these terminals and observe that there is no overshoot on the bias supply voltage when the short circuit is applied or removed.

(6) 200 VOLT SUPPLY (Varactor Tuned Units).

Measure the DC voltage at A7P1-19 to be minus 75 volts with respect to ground.

(7) TUNING SUPPLY

a. Set the sweep oscillator controls as follows:

SWEEP FUNCTION	CW (M1)
M1	nominal low end of band exactly on scale division

b. Yig Tuned. Set current in tuning coil at low frequency end of band using A2R54 adjustment and measure voltage across A4R1 indicated in Fig.6-9. Check stability by momentarily shorting the base of A7Q2 to ground and after removing the short, noting that the circuit returns to normal operation.

Set M1 at nominal high end of band, exactly on scale division. Set current at high frequency end using A2R12 adjustment and measuring voltage across A4R1 indicated in Fig. 6-9.

c. Varactor Tuned. Set tuning voltage at low frequency end of band using A2R54 adjustment and measuring the tuning voltage at A7TB2-6 indicated in Fig. 6-9. Check stability by momentarily shorting A7TB2-6 to ground and after removing the short, noting that the circuit returns to normal operation.

For initial installation of an RF Oscillator, the diode-resistor shaping network may have to be re-specified. In this event the unit

should be returned to the factory for recalibration.

(8) Install and connect RF Oscillator.

(9) Perform procedures 6-11 through 6-15

(10) Perform procedures 6-1 through 6-10.

(11) The following paragraph designation refers to the manual for the 230A Sweep Oscillator. Perform procedures 6-3 through 6-8.

(12) Perform procedures 6-14 through 6-19 in the 230A Sweep Oscillator manual.

(13) Perform procedure 6-23 in 230A Sweep Oscillator manual to complete the calibration.

Model	RF Frequency Range GHz	Type of Tuning	Terminal Number on A7TB2		Comment
			Bias	Tuning	
238A,B	.01-2	Varactor	5	6	
231A	1-2	Varactor	5	6	
232A	2-4	Yig	3, 5	1, 2	Place short circuit jumper across 1, 2
242A	1.7-4.2	Yig	3, 5	1, 2	"
234A	8-12.4	Yig	5	1, 2	"
235A	12.4-18	Yig	5	1, 2	"

Bias and Tuning Supply Connections

Figure 6-8

Model	RF Freq. Range GHz	Type of Tuning	Bias		Nominal Tuning Voltage, Volts		Terminal Number
			Voltage Volts	Terminal No. on A7TB2 (No.4 is gnd.)	Low Freq. End	High Freq. End	
238A,B	.01- 2	Varactor	+24	5	+0.5	-60	A7TB2-6
231A	1- 2	Varactor	+24	5	+0.5	-60	A7TB2-6
232A	2- 4	Yig	+20V - 5V	5 3	- 5.5	-11	A4R1 (68.1 ohm)
242A	1.7- 4.2	Yig	+20V	5	- 4.6	-11.5	A4R1 (68.1 ohm)
234A	8-12.4	Yig	WJ NOTE 1 VA NOTE 1	5	- 7.5 - 5.3	-11.6 - 8.2	A4R1 (15 ohm) A4R1 (15 ohm)
235A	12.4-18	Yig	WJ NOTE 1 VA NOTE 1	5	- 7.9 - 4.0	- 8.2 - 6.0	A4R1 (8 ohm) A4R1 (8 ohm)

NOTE 1: See label on RF Oscillator for exact value.

WJ - Watkins Johnson
VA - Varian Associates

Bias and Tuning Supply Voltages

Figure 6-9

TABLE 6-3

TROUBLE SHOOTING SYMPTOMS

Note: See also Table 6-3 of 230A SWEEP OSCILLATOR Instruction Manual

SYMPTOM	TROUBLE LOCATION	PROBABLE CAUSE
No RF output	Bias supply	Low or no bias voltage
	Tuning Supply	Too low or too high
	Leveling amplifier	Turn-off bias applied to diode modulator
	Coaxial cable or connector	Defective
	Diode modulator	Defective
	RF oscillator	Defective
No control of RF level	Leveling amplifier	Defective component
	Diode modulator	Defective
No Leveling	Directional detector	Defective diode or connection
High residual FM in CW mode	Tuning supply	Low gain Excessive ripple Defective relay
Frequency Calibration	Mainframe	Requires calibration
	Tuning supply	Defective component

TABLE 6-4

TROUBLE SHOOTING THE BIAS SUPPLY

6-4. POSITIVE BIAS SUPPLY

STEP	SYMPTOM	PROCEDURE	INDICATION	CONCLUSION
1	High output	Measure -15V	High voltage	Defective reference supply
			Normal voltage	Proceed to step 2
2		Measure voltage from A7Q1 base to emitter	Less than -½V	Shorted A7Q1
			More than -½V	Proceed to step 3
3		Measure voltage from A2Q8 base to chassis	Less than -1V	Defective A2Q8
			More than -1V	Proceed to step 4
4		Measure voltage from A2IC1-5 to A2IC1-4 (return)	Pin 5 more than +0.1V	A2IC1 defective
			Pin 5 more than -0.1V	Defective A2R55 or A2R56
			Pins 4 and 5 within ±0.1V	Shorted CR32 or 33 or defective IC1
5	Low output	Localize cause	Between ½ and 1V	Proceed to step 6
			Otherwise	Proceed to step 9
6		Feel A2CR20	Cold	Proceed to step 9
			Warm	Protective crowbar circuit conducting proceed to step 7
7		Turn primary power off, than on again. Recheck bias supply voltage	Normal (refer to oscillator data sheet in front of manual for normal bias supply voltage)	Crowbar was energized by a transient or an intermittent failure
			Between ½ and 1V	Disconnect oscillator from A7TB2. Proceed to step 8

6-4. CONT'D

STEP	SYMPTOM	PROCEDURE	INDICATION	CONCLUSION
8	Low output (cont'd)	Turn power off. Remove A2R68. Turn power on	Bias supply voltage from ½ to 1V	Defective A2Q9 or A2CR20
			Bias supply voltage higher than normal	Proceed to step 1. After repairing failure, reinstall A2R68, verify normal bias voltage and reconnect RF oscillator to A7TB2
9		Measure -15V Reference voltage	Low voltage	Defective reference supply
			Normal voltage	Proceed to step 10
		Measure voltage from A7Q1 collector to chassis	Less than -1½V	Defective A7F1 or A7CR1, low or no unregulated input to bias supply from mainframe
			More than required bias voltage	Proceed to step 10
10		Measure voltage from A7Q1 base to chassis	More than -1V	Defective A7Q1, A7R14 or A2R75
			Less than -1V	Proceed to step 11
11		Measure voltage from A7J2-17 to chassis	More than -½V	Bias supply shorted due to defective A7CR5, defective oscillator, short in wiring
			Less than -½V	Proceed to step 12
12		Measure voltage from A7J2-11 to chassis	More than -1V	Defective A2Q8 or associated component
			From -½ to -1V	Defective A2Q7
			From -½ to +1V	Proceed to step 13

6-4. CONT'D

STEP	SYMPTOM	PROCEDURE	INDICATION	CONCLUSION
13	Low output (cont'd)	Measure voltage from A2IC1-5 to A2IC1-4 (return)	Pin 5 more than -0.1V	Defective IC1
			Pin 5 more than +0.1V	Defective A2C11, A2R55 or A2R56
			Pin 5 and 4 within ±0.1V	Defective A2CR32, A2CR33 or A2IC1

TABLE 6-5

TROUBLE SHOOTING THE BIAS SUPPLY

6-5. NEGATIVE BIAS SUPPLY

STEP	SYMPTOM	PROCEDURE	INDICATION	CONCLUSION
1	High output	Measure +15V Reference voltage	High voltage	Defective reference supply
			Normal voltage	Proceed to step 2
2		Measure voltage from A5Q5* base to emitter	More than +½V	Proceed to step 3
3		Measure voltage from A3Q7* base to chassis	Less than +1V	Defective A3Q7
			More than +1V	Proceed to step 4
4		Measure voltage from A2IC1-5 to A2IC1-4 (return)	Pin 5 more than +0.1V	A2IC1 defective
			Pin 5 more than -0.1V	Defective A2R55 or A2R56
			Pins 4 and 5 within ±0.1V	Shorted CR32 or 33 or defective IC1
5	Low output	Localize cause	Between ½ and 1V	Proceed to step 6
			Otherwise	Proceed to step 9
6		Feel A2CR20	Cold	Proceed to step 9
			Warm	Protective crowbar circuit conducting. Proceed to step 7
7		Turn primary power off, then on again. Recheck bias supply voltage	Normal (refer to oscillator data sheet in front of manual for normal bias supply voltage)	Crowbar was energized by a transient or an intermittent failure
			Between ½ and 1V	Disconnect oscillator from A7TB2. Proceed to step 8.

*Located in 230A SWEEP OSCILLATOR mainframe

6-5. CONT'D

STEP	SYMPTOM	PROCEDURE	INDICATION	CONCLUSION
8	Low output (cont'd)	Turn power off Remove A2R68. Turn power on	Bias supply voltage from ½ to 1 Volt	Defective A2Q9 or A2CR20
			Bias supply voltage higher than normal	Proceed to step 1. After repairing failure, reinstall A2R68, verify normal bias voltage and reconnect RF oscillator to A7TB2
9		Measure +15V Reference voltage	Low voltage	Defective reference supply
			Normal voltage	Proceed to step 10
		Measure voltage from A5Q5* collector to chassis	Less than +1½V	Defective A7F1 or A5CR1*, low or no unregulated input to bias supply
			More than required bias supply	Proceed to step 10
10		Measure voltage from A5Q5* base to chassis	More than +1V	Defective A5Q5*, A5R2* or A3R22*
			Less than +1V	Proceed to step 11
11		Measure voltage from A5J4-23* to chassis	More than +½V	Bias supply shorted due to defective A7CR5, defective oscillator, short in wiring
			Less than +½V	Proceed to step 12
12		Measure voltage from A5J4-19* to chassis	More than +1V	Defective A3Q7* or associated component
			From +½ to +1V	Defective A3Q7*
			From +½ to -1V	Proceed to step 13

*) Located in 230A SWEEP OSCILLATOR mainframe

6-5. CONT'D

STEP	SYMPTOM	PROCEDURE	INDICATION	CONCLUSION
13	Low output (cont'd)	Measure voltage from A2IC1-5 to A2IC1-4 (return)	Pin 5 more than +0.1V	Defective IC1
			Pin 5 more than -0.1V	Defective A2C11, A2R55 or A2R56
			Pin 5 and 4 within +0.1V	Defective A2R32, A2CR33 or A2IC1

TABLE 6-6

TROUBLESHOOTING THE YIG SUPPLY

6-6.

STEP	SYMPTOM	PROCEDURE	INDICATION	CONCLUSION
1	Sluggish response (low band-width)	Check control settings	Sweep function selector in CW	Inappropriate setting
			Sweep response time switch in slow	
2		Measure voltage from A7J2-1 to chassis	Less than -10V	Short or leakage to ground defective A8S6*
			If it measures -15V	Shorted relay contacts A2K1B
3	Low or no output current	Measure voltage from A7Q2 collector to A7TB2	No voltage or less than 20VDC	Defective A3F1. A3 assembly not installed. Defective unregulated input to YIG supply from mainframe
			At least 25VDC	Proceed to step 4
4		Measure voltage from A7J2-7 to chassis	At least +5V	Defective A7Q2 or associated component
			Less than +1V	Proceed to step 5
5		Measure voltage from A2Q1 base to chassis	More than +1V	Defective A7Q2 or associated component
			Less than +½V	Shorted A2CR25
			At least -½V	Proceed to step 6
6		Measure voltage across A2R38	More than ½V	Defective A2Q3 or associated component
			Less than ½V	Proceed to step 7

*) Located in 230A SWEEP OSCILLATOR mainframe

6-6. CONT'D

STEP	SYMPTOM	PROCEDURE	INDICATION	CONCLUSION
7	Low or no output current (cont'd)	Measure voltage from A2Q6A base to A2J2-8 (return)	More than +½V	Defective A2Q4, A2Q5 or A2Q6 or associated component
			Less than +½V or negative	Defective A2CR23, A2CR24, A2R34, A2R54, A7R1, A2R12, A2R53 or A2R49. Absence of required signal - Proceed to step 8
8		Measure voltage from A7J2-20 to chassis	Absent	Defective connection
			If it measures +15V	Proceed to step 9
9		Measure voltage from A7J2-3 to A7J2-8	0 to +10V	Normal
			Absent	Defective connection, mainframe waveform generator or associated component
10	High output	Measure voltage from A7J2-7 to chassis	Less than +1V	Defective A7Q2
			At least +1V	Proceed to step 11
11		Measure voltage from A7J2-4 to chassis	Less than -4V	Defective A7R1 or connection
			More than -4V	Proceed to step 12
12		Measure voltage from A2Q1 base to chassis	Less than +1V	Defective A2Q1
			More than +1V	Proceed to step 13
13		Measure voltage across A2R38	Less than ½V	Defective A2Q3
			More than ½V	Proceed to step 14
14		Measure voltage from A2Q6A base to A7J2-8 (return)	More than -½V	Defective A2Q4, A2Q5 or A2Q6 or associated component
			Less than -½V or positive	Defective A2CR23 or A2CR24 or A2R12, A2R34, A2R49, A2R51, A2R53 or A2R54

TABLE 6-7

TROUBLESHOOTING THE VARACTOR SUPPLY

6-7.

STEP	SYMPTOM	PROCEDURE	INDICATION	CONCLUSION
1	Sluggish response (low band-width)	Check control settings	Sweep function selector in CW	Inappropriate setting
			Sweep response time switch in slow	
2		Measure voltage across relay coil A2K1A	15 V	Defective A8S6* leakage or short in K1A circuit
			Voltage absent	Shorted relay contacts A2K1B
3	High output voltage	Measure voltage from A2Q3 collector to chassis	Less than the varactor supply output voltage (by more than 1V)	Defective A2Q1 or A2Q2
			Within 1 Volt of the output	Proceed to step 4
4		Measure voltage across A2R38	About 3/4 Volt or more	Defective A2Q3
			Less than ½V	Proceed to step 5
5		Measure voltage from A2Q6B base to the opposite side of A2CR23, A2CR24 (return)	More than -½V	Defective A2Q4, A2Q5, A2Q6 or associated component
			Less than -½V or positive	Defective A2CR23, A2CR24, A2R22, A2R33, A2R34, A2R51, A2R53, A2R54
6	Low output voltage	Measure voltage from A2CR13	Absent or low	Defective A5Q2* or A5Q3* or associated component defective unregulated 200V supply
			About 200V	Proceed to step 7

*) Located in 230A SWEEP OSCILLATOR mainframe

STEP	SYMPTOM	PROCEDURE	INDICATION	CONCLUSION
7	Low output voltage (cont'd)	Measure voltage across A2CR13	Absent or low	Defective A2CR13
			A few volts greater than the required maximum varactor supply voltage	Proceed to step 8
8		Measure the voltage from collector to chassis	More negative than the varactor supply output (by at least 1V)	Defective A2Q1 or A2Q2 or associated component
			Within 1 Volt of the output	Proceed to step 9
9		Measure voltage across A2R38	Less than ½ V	Defective A2Q3 or associated component
			About 3/4 V	Proceed to step 10
10		Measure voltage from A2Q6B base to the opposite side of A2CR23, A2CR24 (return)	More than +½V	Defective A2Q4, A2Q5 or A2Q6 or associated component
			Less than +½V or positive	Defective A2CR23, A2CR24 or A2R22, A2R33, A2R34, A2R51, A2R53 or A2R54

TABLE 6-8

TROUBLESHOOTING THE LEVELER

6-8.

STEP	SYMPTOM	PROCEDURE	INDICATION	CONCLUSION
1	No RF output	Measure output voltage of Leveler applied to diode Modulator. Rotate RF level control knob from maximum to minimum	Voltage changes at least 1½V, with polarity reversed	Defective diode modulator or connection
			Voltage changes only slightly	Alignment required or proceed to step 2
2		Measure bias voltage and tuning voltage (or current) of RF oscillator	Absent or abnormal values	Defective bias or tuning supply. Proceed to Table
			Normal values	Proceed to step 3
3		Measure voltage from A7S2D to chassis	More than -1V	Inappropriate mainframe control settings, defective mainframe A2 assembly or associate circuit
			Less than ±1V	Proceed to step 4
4	No RF output	Rotate RF level control maximum clockwise. Measure voltage from A1IC2-10 to chassis	At least -1V	Defective transistor or associated component in current amplifier section
			Less than -1V or positive	Proceed to step 6
5		Measure voltage from A1IC2-4 to A1IC2-5 (return)	More than +½V	Defective A2IC2
			Less than ±½V	Defective diode or other associated component in IC2 and RF level control circuit
6	Maximum RF output RF level control ineffective	Measure output voltage of leveler applied to diode modulator. Rotate RF level control knob from maximum to minimum	Voltage change of at least 1½V, with polarity reversed	Defective diode modulator or connection

6-8. CONT'D

STEP	SYMPTOM	PROCEDURE	INDICATION	CONCLUSION
6	Maximum RF output. RF Level control ineffective (cont'd)	Measure output voltage of leveler applied to diode modulator. Rotate RF level control knob from maximum to minimum (cont'd)	Voltage changes only slightly	Alignment required or proceed to step 7
7		Rotate RF level control maximum counter clockwise measure voltage from A1IC2-10 to chassis	At least 1V	Defective transistor or associated component in current amplifier section
			Less than +1V or negative	Defective A1IC2 or associated component
8	RF output unleveled and changes abruptly when RF level control rotated, in leveled mode	-	-	Defective directional detector or connection

SECTION 7-0

REPLACEABLE PARTS

7-1. INTRODUCTION. This section provides information for procuring replaceable parts for the RF Unit.

7-2. REFERENCE DESIGNATIONS AND ABBREVIATIONS. See Table 7-1 for a complete explanation of reference designations and abbreviations.

7-3. ORDERING INFORMATION. The following information should be included when ordering replacement parts for the RF Unit.

a. The Micro-Power Division part number and description of the part.
b. The instrument's model number and serial number.
c. If ordering a part not included in the replaceable parts list, include a complete description of the part, its function and its location within the equipment.

7-4. PARTS LISTS AND CROSS REFERENCE TABLE. Table 7-2 is a model/assembly cross reference which lists the replaceable parts table applicable to each model of RF Unit. This table provides the part number of each major assembly and the appropriate table which details all parts of that major assembly. Table 7-3 lists the part numbers of calibrated frequency scales. Tables 7-4 through 7-32 are detailed parts lists of the major assemblies.

TABLE 7-1

ABBREVIATIONS AND REFERENCE DESIGNATIONS

All reference designations for electrical parts will be preceded by a prefix which will indicate the assembly in which it is contained. These prefixes will be identified as follows:

A1 - LEVELER
A2 - TUNING AND BIAS SUPPLIES
A3 - FM AMPLIFIER
A4 - RF ASSEMBLY
A5 - SYMMETRICAL SWEEP SWITCH
A6 - LEVELER SWITCH
*A7 - MAIN ASSEMBLY

* Includes all parts within mainframe not included in Assembly A1-A6.

ABBREVIATIONS

A-Amperes
AMPL-Amplifier
AM-Amplitude modulation
APPROX-Approximate
ASS'Y-Assembly
AUX-Auxiliary
AVG-Average
BAL-Balance
BWO-Backward wave oscillator
C-Cathode
CAL-Calibrator
CCW-Counterclockwise
CW-Clockwise
dB-Decibel
dBm-Decibel (referred to 1 milliwatt in 600 ohms)
EXT-External
F-Farad
FIG-Figure
FIX-Fixed
FM-Frequency modulate
A-Assembly
B-Motor
C-Capacitor
CR-Diode
DS-Lamp
F-Fuse
FWD-Forward
G-Giga=10^{9}
GRD-Ground
H-Henry
Hz-Cycle per second
IDENT-Identification
IMP-Impulse
INT-Internal
K-Kilo=10^{3}
LIN-Linear
M-Milli=10^{-3}
MAX-Maximum
MEG-Meg=10^{6}
MFG-Manufacturer
MIN-Minimum
N-Nano=10^{-9}
NC-Normally closed
NEG-Negative
NO-Normally open
Ω -Ohm
O -Peak
J -Jack
K -Relay
L -Inductor
M -Meter
P -Plug
Q -Transistor
PC-Printed Circuit
PF-Pico farads=10^{-12} farads
P/O-Part of
POT-Potentiometer
P-P-Peak to Peak
RECT-Rectifier
RES-Resistance or Resistor
RET-Return
REV-Reverse
RF-Radio Frequency
RMS-Square root of mean square
SEC-Second
SW-Switch
SYM-Symmetrical
TRIG-Trigger
TYP-Typical
U-Micro=10^{-6}
V-Volt
VAR-Variable
W-Watts
R-Resistor
S-Switch
T-Transformer
TB-Terminal board
TP-Test point
V-Vacuum
X-Socket

TABLE 7-2

MODEL/ASSEMBLY CROSS REFERENCE

MODEL NO.	A1 LEVELER		A2 TUNING AND BIAS SUPPLY		A3 FM AMPLIFIER		A4 RF AMPLIFIER		A5 SYM SWP SWITCH		A6 LEVELER SW ASSY		A7 BASIC PLUG-IN ASSY	
	Table	Part No.	Table	Part No.	Table	Part No.	Table	Part No.	Table	Part No.	Table	Part No.	Table	Part No.
231A	7-4	207-072	7-7	207-081	N/A	N/USED	7-14	250-027	7-22	250-008	7-28	250-012	7-30	250-007
232A	7-4	207-072	7-6	207-079	7-12	207-135	7-15	250-028	7-23	250-011	7-28	250-012	7-30	250-007
234A(WJ)	7-4	207-072	7-8	207-151	7-13	207-152	7-16	250-030	7-26	250-051	7-28	250-012	7-30	250-007
234A(VA)	7-4	207-072	7-9	207-153	7-13	207-152	7-19	250-056	7-26	250-051	7-28	250-012	7-30	250-007
235A(WJ)	7-4	207-072	7-10	207-162	7-13	207-152	7-20	250-062	7-27	250-052	7-28	250-012	7-30	250-007
235A(VA)	7-4	207-072	7-11	207-163	7-13	207-152	7-21	250-064	7-27	250-052	7-28	250-012	7-30	250-007
238A	7-5	207-137	7-7	207-081	N/A	N/USED	7-18	250-053	7-24	250-032	7-29	250-046	7-32	250-054
238B	7-5	207-137	7-7	207-081	N/A	N/USED	7-17	250-031	7-24	250-032	7-29	250-046	7-31	250-036
242A	7-4	207-072	7-6	207-136	7-12	207-135	7-15	250-028	7-25	250-043	7-28	250-012	7-30	250-007

TABLE 7-3

FREQUENCY SCALE PART NUMBERS

MODEL	FREQUENCY RANGE	PART NUMBER
231A	1-2 GHz	209-041
232A	2-4 GHz	209-042
233A	4-8 GHz	209-043
234A	8-12.4 GHz	209-044
235A	12.4-18 GHz	209-046
236A	18-26 GHz	209-056
237A	26-40 GHz	209-057
238A	0.1-2 GHz	209-045
239A	100-1000 MHz	209-058
240A	1-100 MHz	209-059
241A	1.4-2.5 GHz	209-060
242A	1.7-4.2 GHz	209-049
243A	3.6-4.3 GHz	209-061
244A	5.85-6.45 GHz	209-062

TABLE 7-4

ASSEMBLY A1
REPLACEABLE PARTS
LEVELER, TYPE A
(207-072)

REFERENCE DESIGNATION	MICRO-POWER PART NUMBER	DESCRIPTION
A1	207-072	Leveler, Type A
A1C1	430-019	4700 pf 10% 50V Mylar
A1C2	460-221	220 pf 10% 500V Mica
A1C3	450-471	470 pf 10% 500V Mica
A1C4	460-220	22 pf 10% 500V Mica
A1C5	460-681	680 pf 10% 500V Mica
A1C6	440-040	10 uf 20% 20V Tant
A1C7	400-044	100 uf -10+100% 12V Elect
A1C8		Not Used
A1C9	430-032	0.22 uf 10% 50V Mylar
A1CR1	500-010	Diode
A1CR2	500-010	Diode
A1CR3	500-010	Diode
A1CR4	500-010	Diode
A1CR5	500-010	Diode
A1CR5	500-010	Diode
A1CR6	500-010	Diode
A1CR7	500-010	Diode
A1CR8	500-010	Diode
A1CR9	500-010	Diode
A1IC1	503-001	I.C. Amplifier
A1IC2	503-001	I.C. Amplifier
A1Q1	502-010	Transistor
A1Q2	502-024	Transistor
A1Q3	502-010	Transistor
A1Q4		Not Used
A1Q5	502-005	Transistor
A1R1	300-102	1000 ohm 10% 1/4W Comp
A1R2	300-102	1000 ohm 10% 1/4W Comp
A1R3	300-332	3300 ohm 10% 1/4W Comp
A1R4	300-102	1000 ohm 10% 1/4W Comp
A1R5	300-152	1500 ohm 10% 1/4W Comp
A1R6	300-103	10K ohm 10% 1/4W Comp
A1R7	300-472	4700 ohm 10% 1/4W Comp
A1R8	300-103	10K ohm 10% 1/4W Comp
A1R9	300-153	15K ohm 10% 1/4W Comp
A1R10	300-222	2200 ohm 10% 1/4W Comp

TABLE 7-4 (CONT'D)

REFERENCE DESIGNATION	MICRO-POWER PART NUMBER	DESCRIPTION			
A1R11	300-221	220 ohm	10%	1/4W	Comp
A1R12	304-006	10K ohm	10%	1/2W	W.W. Lin Var
A1R13	300-102	1000 ohm	10%	1/4W	Comp
A1R14	300-473	47K ohm	10%	1/4W	Comp
A1R15	300-223	22K ohm	10%	1/4W	Comp
A1R16	315-039	2150 ohm	1%	1/8W	Met Film
A1R17	300-152	1500 ohm	10%	1/4W	Comp
A1R18	300-333	33K ohm	10%	1/4W	Comp
A1R19	300-152	1500 ohm	10%	1/4W	Comp
A1R20	300-333	33K ohm	10%	1/4W	Comp
A1R21	300-103	10K ohm	10%	1/4W	Comp
A1R22	300-682	6800 ohm	10%	1/4W	Comp
A1R23	300-221	220 ohm	10%	1/4W	Comp
A1R24	300-333	33K ohm	10%	1/4W	Comp
A1R25	300-474	470K ohm	10%	1/4W	Comp
A1R26	305-058	332 ohm	1%	3W	W.W.
A1R27	315-038	4320 ohm	1%	1/8W	Met Film
A1R28	315-038	4320 ohm	1%	1/8W	Met Film
A1R29	300-682	6800 ohm	10%	1/4W	Comp
A1R30	300-472	4700 ohm	10%	1/4W	Comp
A1R31	315-040	1270 ohm	1%	1/8W	Met Film
A1R32	300-103	10K ohm	10%	1/4W	Comp
A1R33	300-682	6800 ohm	10%	1/4W	Comp
A1R34		Not Used			
A1R35		Not Used			
A1R36		Not Used			
A1R37		Not Used			
A1R38	303-101	100 ohm	10%	2W	Comp
A1R39	300-330	33 ohm	10%	1/4W	Comp
A1R40		Not Assigned			
A1R41	300-152	1500 ohm	10%	1/4W	Comp
A1R42	300-333	33K ohm	10%	1/4W	Comp

TABLE 7-5

ASSEMBLY A1
REPLACEABLE PARTS
LEVELER, TYPE B
(207-137)

REFERENCE DESIGNATION	MICRO-POWER PART NUMBER	DESCRIPTION
A1	207-137	Leveler, Type B
A1C1	430-019	4700 pf 10% 50V Mylar
A1C2	460-221	220 pf 10% 500V Mica
A1C3	460-101	100 pf 10% 500V Mica
A1C4	415-005	3300 pf 5% 1KV FixedComp
A1C5	440-041	1.0 uf 20% 20V Tant
A1C6	440-041	1.0 uf 20% 20V Tant
A1C7	460-101	100 pf 10% 500V Mica
A1C8	430-027	0.01 uf 10% 50V Mylar
A1C9	430-027	0.01 uf 10% 50V Mylar
A1C10	430-019	4700 pf 10% 50V Mylar
A1C11	430-019	4700 pf 10% 50V Mylar
A1C12	460-101	100 pf 10% 500V Mica
A1C13	460-221	220 pf 10% 500V Mica
A1CR1	500-010	Diode
A1CR2	500-010	Diode
A1CR3	500-010	Diode
A1CR4	500-010	Diode
A1CR5		Not Used
A1CR6	500-010	Diode
A1CR7	500-010	Diode
A1CR8	501-013	Diode, Zener
A1CR9	500-010	Diode
A1CR10	500-010	Diode
A1CR11	501-007	Diode, Zener
A1CR12		Not Used
A1CR13	500-010	Diode
A1IC1	503-001	I.C. Amplifier
A1IC2	503-001	I.C. Amplifier
A1Q1	502-010	Transistor
A1Q2		Not Used
A1Q3	502-010	Transistor
A1Q4	502-026	Transistor
A1Q5	502-026	Transistor
A1Q6	502-010	Transistor
A1Q7	502-005	Transistor
A1Q8	502-026	Transistor
A1Q9	502-024	Transistor

TABLE 7-5 (CONT'D)

REFERENCE DESIGNATION	MICRO-POWER PART NUMBER	DESCRIPTION
A1R1	300-222	2200 ohm 10% 1/4W Comp
A1R2	300-152	1500 ohm 10% 1/4W Comp
A1R3	300-470	47 ohm 10% 1/4W Comp
A1R4	300-222	2200 ohm 10% 1/4W Comp
A1R5		Selected at Test
A1R6	315-061	10K ohm 1% 1/8W Met Film
A1R7	300-223	22K ohm 10% 1/4W Comp
A1R8	300-153	15K ohm 10% 1/4W Comp
A1R9	300-102	1000 ohm 10% 1/4W Comp
A1R10	300-102	1000 ohm 10% 1/4W Comp
A1R11	300-683	68K ohm 10% 1/4W Comp
A1R12		Selected at Test
A1R13	315-111	5110 ohm 1% 1/8W Met Film
A1R14	300-333	33K ohm 10% 1/4W Comp
A1R15	315-111	5110 ohm 1% 1/8W Met Film
A1R16	300-152	1500 ohm 10% 1/4W Comp
A1R17	300-470	47 ohm 10% 1/4W Comp
A1R18	300-474	470 ohm 10% 1/4W Comp
A1R19	315-088	15K ohm 1% 1/8W Met Film
A1R20	304-005	1000 ohm 10% 1/2W WW LinVar
A1R21	315-001	14 ohm 1% 1/8W Met Film
A1R22	300-474	470K ohm 10% 1/4W Comp
A1R23	300-102	1000 ohm 10% 1/4W Comp
A1R24	300-474	470K ohm 10% 1/4W Comp
A1R25		Not Used
A1R26		Not Used
A1R27	300-472	4700 ohm 10% 1/4W Comp
A1R28	300-472	4700 ohm 10% 1/4W Comp
A1R29	304-005	1000 ohm 10% 1/2W WW LinVar
A1R30	300-104	100K ohm 10% 1/4W Comp
A1R31	300-102	1000 ohm 10% 1/4W Comp
A1R32	300-102	1000 ohm 10% 1/4W Comp
A1R33	300-102	1000 ohm 10% 1/4W Comp
A1R34	300-102	1000 ohm 10% 1/4W Comp
A1R35	300-102	1000 ohm 10% 1/4W Comp
A1R36	300-103	10K ohm 10% 1/4W Comp
A1R37		Selected at Test
A1R38	302-102	1000 ohm 10% 1W Comp
A1R39	300-682	6800 ohm 10% 1/4W Comp
A1R40	300-101	100 ohm 10% 1/4W Comp
A1R41	300-101	100 ohm 10% 1/4W Comp
A1R42	300-472	4700 ohm 10% 1/4W Comp
A1R43	300-101	100 ohm 10% 1/4W Comp
A1R44	300-100	10 ohm 10% 1/4W Comp
A1R45	300-100	10 ohm 10% 1/4W Comp

TABLE 7-5 CONT'D)

REFERENCE DESIGNATION	MICRO-POWER PART NUMBER	DESCRIPTION
A1R46		Selected at Test
A1R47	300-101	100 ohm 10% 1/4W Comp
A1R48	300-473	47K ohm 10% 1/4W Comp
A1R49	300-474	470K ohm 10% 1/4W Comp
A1R50	300-104	100K ohm 10% 1/4W Comp
A1R51	315-061	10K ohm 1% 1/8W Met Film
A1R52	315-055	2490 ohm 1% 1/8W Met Film
A1R53	315-001	14 ohm 1% 1/8W Met Film
A1R54	315-088	15K ohm 1% 1/8W Met Film
A1R55	300-470	47 ohm 10% 1/4W Comp
A1R56	315-081	3010 ohm 1% 1/8W Met Film
A1R57	300-102	1000 ohm 10% 1/4W Comp
A1R58	300-332	3300 ohm 10% 1/4W Comp
	233-007	Transistor Pad
	233-011	I.C. Socket
	201-032	Eyelet, Tunnel FL, Copper

TABLE 7-6

ASSEMBLY A2
REPLACEABLE PARTS
TUNING AND BIAS SUPPLY
(207-079 and 207-136)

REFERENCE DESIGNATION	MICRO-POWER PART NUMBER	DESCRIPTION
A2	207-079	Tuning & Bias Supply (Model 232A)
A2	207-136	Tuning & Bias Supply (Model 242A)
A2C1	440-040	10 uf 20% 20V Tant
A2C2	430-011	0.1 uf 10% 50V Mylar
A2C3	430-011	0.1 uf 10% 50V Mylar
A2C4		Not Used
A2C5	430-013	.0033 uf 10% 600V Mylar
A2C6	430-027	0.01 uf 10% 50V Mylar
A2C7		Not Used
A2C8	430-027	0.01 uf 10% 50V Mylar
A2C9	430-011	0.1 uf 10% 50V Mylar
A2C10	460-330	33pf 10% 500V Mica
A2C11	430-032	0.22 uf 10% 50V Mylar
A2C12	430-017	0.047 uf 10% 50V Mylar
A2C13	420-035	.002 uf 20% 1KV Cer
A2C14	400-043	10 uf -10+100% 25V Elect
A2C15	400-041	100 uf -10+100% 25V Elect
A2C16	460-221	220 pf 10% 500V Mica
A2C17	430-019	4700 pf 10% 50V Mylar
A2CR1		Not Used
A2CR2		Not Used
A2CR3		Not Used
A2CR4		Not Used
A2CR5		Not Used
A2CR6		Not Used
A2CR7		Not Used
A2CR8		Not Used
A2CR9		Not Used
A2CR10		Not Used
A2CR11		Not Used
A2CR12		Not Used
A2CR13		Not Used
A2CR14		Not Used
A2CR15		Not Used
A2CR16	500-010	Diode
A2CR17	500-010	Diode
A2CR18	501-013	Diode, Zener
A2CR19		Not Used
A2CR20	500-019	SCR
A2CR21	500-010	Diode
A2CR22		Not Used
A2CR23	500-010	Diode
A2CR24	500-010	Diode

TABLE 7-6 (CONT'D)

REFERENCE DESIGNATION	MICRO-POWER PART NUMBER	DESCRIPTION
A2CR25	500-010	Diode
A2CR26	500-013	Diode
A2CR27	500-010	Diode
A2CR28		Not Used
A2CR29	500-010	Diode
A2CR30	500-010	Diode
A2CR31		Not Used
A2CR32	500-010	Diode
A2CR33	500-010	Diode
A2CR34,35	500-010	Diode
A2CR36,37	500-010	Diode
A2IC1	503-001	I.C. Amplifier
A2IC2	503-001	I.C. Amplifier
A2K1A	216-002	Relay Coil
A2K1B	211-014	Reed
A2Q1	502-024	Transistor
A2Q2		Not Used
A2Q3	502-026	Transistor
A2Q4	502-010	Transistor
A2Q5	505-010	Transistor
A2Q6	502-031	Transistor
A2Q7	502-013	Transistor
A2Q8	502-013	Transistor
A2Q9	502-026	Transistor (Cont'd)
A2R1		Not Used
A2R2		Not Used
A2R3		Not Used
A2R4		Not Used
A2R5		Not Used
A2R6		Not Used
A2R7		Not Used
A2R8		Not Used
A2R9		Not Used
A2R10		Not Used
A2R11		Not Used
A2R12	304-005	1000 ohm 10% 1/2W WW Lin Var
A2Q10	502-005	Transistor
A2Q11	502-010	Transistor

TABLE 7-6 (CONT'D)

REFERENCE DESIGNATION	MICRO-POWER PART NUMBER	DESCRIPTION
A2R13		Not Used
A2R14		Not Used
A2R15		Not Used
A2R16		Not Used
A2R17		Not Used
A2R18		Not Used
A2R19		Not Used
A2R20		Not Used
A2R21		Not Used
A2R22		Not Used
A2R23		Not Used
A2R24		Not Used
A2R25		Not Used
A2R26		Not Used
A2R27		Not Used
A2R28		Not Used
A2R29		Not Used
A2R30		Not Used
A2R31		Not Used
A2R32		Not Used
A2R33		Not Used
A2R34		Model 232A
	315-036	16.9K ohm 1% 1/8W Met Film
A2R34		Model 242A
	315-085	21K ohm 1% 1/8W Met Film
A2R35	315-095	1.0 Meg ohm 1% 1/8W Met Film
A2R36	315-095	1.0 Meg ohm 1% 1/8W Met Film
A2R37	300-103	10K ohm 10% 1/4W Comp
A2R38	300-103	10K ohm 10% 1/4W Comp
A2R39	300-470	47 ohm 10% 1/4W Comp
A2R40	300-101	100 ohm 10% 1/4W Comp
A2R41	300-473	47K ohm 10% 1/4W Comp
A2R42	300-101	100 ohm 10% 1/4W Comp
A2R43	315-019	100K ohm 1% 1/8W Met Film
A2R44	300-470	47 ohm 10% 1/4W Comp
A2R45	300-332	3300 ohm 10% 1/4W Comp
A2R46	315-124	750K ohm 1% 1/8W Met Film
A2R47	300-103	10K ohm 10% 1/4W Comp
A2R48	300-100	10 ohm 10% 1/4W Comp
A2R49		Model 232A
	315-078	5900 ohm 1% 1/8W Met Film
A2R49		Model 242A
	315-098	7500 ohm 1% 1/8W Met Film
A2R50		Not Used

TABLE 7-6 (CONT'D)

REFERENCE DESIGNATION	MICRO-POWER PART NUMBER	DESCRIPTION
A2R51	315-061	10K ohm 1% 1/8W Met Film
A2R52		Not Used
A2R53	315-061	10K ohm 1% 1/8W Met Film
A2R54		Model 232A
	304-005	1000 ohm 10% 1/2W WW LinVar
A2R54		Model 242A
	304-006	10K ohm 10% 1/2W WW LinVar
A2R55	325-046	20K ohm .05% 1/8W WW
A2R56	325-004	15K ohm .05% 1/8W WW
A2R57		Not Used
A2R58		Not Used
A2R59		Not Used
A2R60		Not Used
A2R61		Not Used
A2R62	300-152	1500 ohm 10% 1/4W Comp
A2R63	300-221	220 ohm 10% 1/4W Comp
A2R64	315-026	1870 ohm 1 % 1/8W Met Film
A2R65	300-682	6800 ohm 10% 1/4W Comp
A2R66	301-681	680 ohm 10% 1/2W Comp
A2R67	315-049	1910 ohm 1% 1/8W Met Film
A2R68	315-	To be determined
A2R69	300-471	470 ohm 10% 1/4W Comp
A2R70	315-057	8060 ohm 1% 1/8W Met Film
A2R71	315-061	10K ohm 1% 1/8W Met Film
A2R72	300-471	470 ohm 10% 1/4W Comp
A2R73		Not Used
A2R74		Not Used
A2R75	305-043	3.56 ohm 1% 3W WW
A2R76	300-027	2.7 ohm 10% 1/4W Comp
A2R77	300-224	220K ohm 10% 1/4W Comp
A2R78	300-101	100 ohm 10% 1/4W Comp
A2R79	300-221	220 ohm 10% 1/4W Comp
A2R80	300-150	15 ohm 10% 1/4W Comp
A2R81	300-152	1500 ohm 10% 1/4W Comp
A2R82	315-088	15K ohm 1% 1/8W Met Film
A2R83	300-332	3300 ohm 10% 1/4W Comp
A2R84		Selected At Test
A2R85	315-	6810 ohm 1% 1/8W Met Film

TABLE 7-7

ASSEMBLY A2
REPLACEABLE PARTS
TUNING AND BIAS SUPPLY
(207-081)

REFERENCE DESIGNATION	MICRO-POWER PART NUMBER	DESCRIPTION
A2	207-081	Tuning & Bias Supply
A2C1	430-026	0.22 uf 10% 200V Mylar
A2C2	430-011	0.1 uf 10% 50V Mylar
A2C3	430-011	0.1 uf 10% 50V Mylar
A2C4		Not Used
A2C5	460-151	150 pf 10% 500V Mica
A2C6	430-027	0.01 uf 10% 50V Mylar
A2C7		Not Used
A2C8	430-024	0.022 uf 10% 50V Mylar
A2C9	430-011	0.1 uf 10% 50V Mylar
A2C10	460-680	68 pf 10% 500V Mica
A2C11	430-032	0.22 uf 10% 50V Mylar
A2C12	430-011	0.1 uf 10% 50V Mylar
A2C13	420-035	0.002 uf 20% 1KV Cer
A2C14	400-043	10 uf -10+100% 25V Elect
A2C15	400-041	100 uf -10+100% 25V Elect
A2C16	430-027	0.01 uf 10% 50V Mylar
A2C17	460-221	220 pf 10% 500V Mica
A2CR1	500-010	Diode
A2CR2	500-010	Diode
A2CR3	500-010	Diode
A2CR4	500-010	Diode
A2CR5	500-010	Diode
A2CR6	500-010	Diode
A2CR7	500-010	Diode
A2CR8	500-010	Diode
A2CR9	500-010	Diode
A2CR10	500-010	Diode
A2CR11	500-010	Diode
A2CR12	500-010	Diode
A2CR13	501-026	Diode, Zener
A2CR14	500-010	Diode
A2CR15	500-010	Diode
A2CR16	500-010	Diode
A2CR17	500-010	Diode
A2CR18	501-013	Diode, Zener
A2CR19	500-010	Diode
A2CR20	500-019	SCR
A2CR21	500-010	Diode
A2CR22	500-010	Diode
A2CR23	500-010	Diode
A2CR24	500-010	Diode
A2CR25	500-010	Diode

TABLE 7-7 (CONT'D)

REFERENCE DESIGNATION	MICRO-POWER PART NUMBER	DESCRIPTION
A2CR26	500-013	Diode
A2CR27	501-013	Diode, Zener
A2CR28	500-010	Diode
A2CR29	500-010	Diode
A2CR30	500-010	Diode
A2CR31		Not Used
A2CR32	500-010	Diode
A2CR33	500-010	Diode
A2CR34	500-010	Diode
A2CR35,36	500-010	Diode
A2IC1	503-001	I.C. Amplifier
A2K1A	216-002	Relay Coil
A2K1B	211-014	Reed
A2Q1	502-024	Transistor
A2Q2	502-032	Transistor
A2Q3	502-026	Transistor
A2Q4	502-010	Transistor
A2Q5	502-010	Transistor
A2Q6	502-031	Transistor
A2Q7	502-013	Transistor
A2Q8	502-013	Transistor
A2Q9	502-026	Transistor
A2R1	305-034	400 ohm 3% 3W WW
A2R2	315-088	15K ohm 1% 1/8W Met Film
A2R3		Not Used
A2R4	315-001	14 ohm 1% 1/8W Met Film
A2R5	315-001	14 ohm 1% 1/8W Met Film
A2R6	315-001	14 ohm 1% 1/8W Met Film
A2R7	315-001	14 ohm 1% 1/8W Met Film
A2R8	315-001	14 ohm 1% 1/8W Met Film
A2R9	315-001	14 ohm 1% 1/8W Met Film
A2R10	315-001	14 ohm 1% 1/8W Met Film
A2R11	315-001	14 ohm 1% 1/8W Met Film
A2R12	315-001	14 ohm 1% 1/8W Met Film
A2R13	315-001	14 ohm 1% 1/8W Met Film
A2R14	315-001	14 ohm 1% 1/8W Met Film
A2R15	315-001	14 ohm 1% 1/8W Met Film
A2R16	315-001	14 ohm 1% 1/8W Met Film
A2R17	315-001	14 ohm 1% 1/8W Met Film
A2R18		To be determined by test
A2R19		To be determined by test
A2R20		To be determined by test

TABLE 7-7 (CONT'D)

REFERENCE DESIGNATION	MICRO-POWER PART NUMBER	DESCRIPTION			
A2R21		To be determined by test			
A2R22		To be determined by test			
A2R23		To be determined by test			
A2R24		To be determined by test			
A2R25		To be determined by test			
A2R26		To be determined by test			
A2R27		To be determined by test			
A2R28		To be determined by test			
A2R29		To be determined by test			
A2R30		To be determined by test			
A2R31		To be determined by test			
A2R32		To be determined by test			
A2R33	315-061	10K ohm	1%	1/8W	Met Film
A2R34	315-068	20K ohm	1%	1/8W	Met Film
A2R35	315-095	1.0 Meg ohm	1%	1/8W	Met Film
A2R36	315-095	1.0 Meg ohm	1%	1/8W	Met Film
A2R37	300-103	10K ohm	10%	1/4W	Comp
A2R38	300-103	10K ohm	10%	1/4W	Comp
A2R39	300-470	47 ohm	10%	1/4W	Comp
A2R40	300-101	100 ohm	10%	1/4W	Comp
A2R41	300-223	22K ohm	10%	1/4W	Comp
A2R42	300-101	100 ohm	10%	1/4W	Comp
A2R43	315-019	100K ohm	1%	1/8W	Met Film
A2R44	300-101	100 ohm	10%	1/4W	Comp
A2R45	300-102	1000 ohm	10%	1/4W	Comp
A2R46	315-124	750K ohm	1%	1/8W	Met Film
A2R47	302-103	10K ohm	10%	1W	Comp
A2R48	300-101	100 ohm	10%	1/4W	Comp
A2R49	300-101	100 ohm	10%	1/4W	Comp
A2R50	302-333	33K ohm	10%	1W	Comp
A2R51	315-020	49.9K ohm	1%	1/8W	Met Film
A2R52*	315-094	330K ohm	1%	1/8W	Met Film
A2R53	315-020	49.9K ohm	1%	1/8W	Met Film
A2R54	304-022	2000 ohm	10%	1/2W	WW LinVar
A2R55	315-079	23.7K ohm	1%	1/8W	WW
A2R56	325-004	15K ohm	.05%	1/8W	WW
A2R57	326-511	511 ohm	3%	3W	WW
A2R58	315-088	15K ohm	1%	1/8W	Met Film
A2R59	315-125	470 ohm	1%	1/8W	Met Film
A2R60		Not Used			
A2R61		Not Used			
A2R62	300-152	1500 ohm	10%	1/4W	Comp
A2R63	300-221	220 ohm	10%	1/4W	Comp
A2R54	300-682	6800 ohm	10%	1/4W	Comp
A2R66	300-681	680 ohm	10%	1/4W	Comp

*Used on 238A and 238B only

TABLE 7-7 (CONT'D)

REFERENCE DESIGNATION	MICRO-POWER PART NUMBER	DESCRIPTION			
A2R67	315-039	2.15K ohm	1%	1/8W	Met Film
A2R68	315-	To be determined by test			
A2R69	300-471	470 ohm	10%	1/4W	Comp
A2R70	315-057	8060 ohm	1%	1/8W	Met Film
A2R71	315-061	10K ohm	1%	1/8W	Met Film
A2R72	300-471	470 ohm	10%	1/4W	Comp
A2R73		Not Used			
A2R74		Not Used			
A2R75	305-017	1.28 ohm	1%	3W	WW
A2R76	300-027	2.7 ohm	10%	1/4W	Comp
A2R77	300-101	100 ohm	10%	1/4W	Comp

TABLE 7-8

ASSEMBLY A2
REPLACEABLE PARTS
(207-151)

REFERENCE DESIGNATION	MICRO-POWER PART NUMBER	DESCRIPTION
A2	207-151	Tuning and Bias Supply
A2C1	440-013	2.2uf 20% 20V Tant
A2C2	430-011	0.1uf 10% 50V Mylar
A2C3	430-011	0.1uf 10% 50V Mylar
A2C4		Not Used
A2C5	430-013	.0033uf 10% 600V Mylar
A2C6	430-027	0.01uf 10% 50V Mylar
A2C7		Not Used
A2C8	430-027	0.01uf 10% 50V Mylar
A2C9	430-011	0.1uf 10% 50V Mylar
A2C10	460-330	33 pf 10% 500V Mica
A2C11	430-032	0.22uf 10% 50V Mylar
A2C12	430-017	0.047uf 10% 50V Mylar
A2C13	420-035	0.002uf 20% 1KV Cer
A2C14	440-042	100uf +20% 20V Tant
A2C15	400-041	100uf -10+100% 25V Elect
A2C16	460-221	220pf 10% 500V Mica
A2C17	430-019	4700pf 10% 50V Mylar
A2CR1		Not Used
A2CR2		Not Used
A2CR3		Not Used
A2CR4		Not Used
A2CR5		Not Used
A2CR6		Not Used
A2CR7		Not Used
A2CR8		Not Used
A2CR9		Not Used
A2CR10		Not Used
A2CR11		Not Used
A2CR12		Not Used
A2CR13		Not Used
A2CR14		Not Used
A2CR15		Not Used
A2CR16	500-010	Diode
A2CR17	500-010	Diode
A2CR18	501-013	Diode, Zener
A2CR19		Not Used
A2CR20	500-019	SCR
A2CR21		Not Used
A2CR22		Not Used
A2CR23	500-010	Diode
A2CR24	500-010	Diode
A2CR25	500-010	Diode

TABLE 7-8 (CONT'D)

REFERENCE DESIGNATION	MICRO-POWER PART NUMBER	DESCRIPTION
A2CR26	500-013	Diode
A2CR27	501-013	Diode, Zener
A2CR28	500-010	Diode
A2CR30		Not Used
A2CR31		Not Used
A2CR32	500-010	Diode
A2CR33	500-010	Diode
A2CR34	500-010	Diode
A2CR35	500-010	Diode
A2CR36	500-010	Diode
A2CR37	500-010	Diode
A2IC1	503-001	I.C. Amplifier
A2IC2	503-001	I.C. Amplifier
A2K1A	216-002	Relay Coil
A2K1B	211-014	Reed
A2Q1	502-024	Transistor
A2Q2		Not Used
A2Q3	502-026	Transistor
A2Q4	502-010	Transistor
A2Q5	502-010	Transistor
A2Q6	502-031	Transistor
A2Q7		Not Used
A2Q8		Not Used
A2Q9	502-026	Transistor
A2Q10	502-005	Transistor
A2R1		Not Used
A2R2		Not Used
A2R3		Not Used
A2R4		Not Used
A2R5		Not Used
A2R6		Not Used
A2R7		Not Used
A2R8		Not Used
A2R9		Not Used
A2R10		Not Used
A2R11		Not Used
A2R12	304-005	1000 ohm 10% 1/2W WW LinVar
A2R13		Not Used
A2R14		Not Used
A2R15		Not Used
A2R16		Not Used

TABLE 7-8 (CONT'D)

REFERENCE DESIGNATION	MICRO-POWER PART NUMBER	DESCRIPTION
A2R17		Not Used
A2R18		Not Used
A2R19		Not Used
A2R20		Not Used
A2R21		Not Used
A2R22		Not Used
A2R23		Not Used
A2R24		Not Used
A2R25		Not Used
A2R26		Not Used
A2R27		Not Used
A2R28		Not Used
A2R29		Not Used
A2R30		Not Used
A2R31		Not Used
A2R32		Not Used
A2R33		Not Used
A2R34	315-058	9090 ohm 1% 1/8W Met Film
A2R35	315-095	1.0 MEG ohm 1% 1/8W Met Film
A2R36	315-095	1.0 MEG ohm 1% 1/8W Met Film
A2R37	300-103	10K ohm 10% 1/4W Comp
A2R38	300-103	10K ohm 10% 1/4W Comp
A2R39	300-470	47 ohm 10% 1/4W Comp
A2R40	300-101	100 ohm 10% 1/4W Comp
A2R41	300-473	47K ohm 10% 1/4W Comp
A2R42	300-101	100 ohm 10% 1/4W Comp
A2R43	315-019	100K ohm 1% 1/8W Met Film
A2R44	300-470	47 ohm 10% 1/4W Comp
A2R45	300-152	1500 ohm 10% 1/4W Comp
A2R46	315-124	750K ohm 1% 1/8W Met Film
A2R47	300-103	10K ohm 10% 1/4W Comp
A2R48	300-100	10 ohm 10% 1/4W Comp
A2R49	315-014	3480 ohm 1% 1/8W Met Film
A2R50		Not Used
A2R51	315-061	10K ohm 1% 1/8W Met Film
A2R52		Not Used
A2R53	315-061	10K ohm 1% 1/8W Met Film
A2R54	304-005	1000 ohm 10% 1/2W WW LinVar
A2R55		Factory Selected
A2R56	325-004	15K ohm .05% 1/8W WW
A2R57		Not Used
A2R58		Not Used
A2R59		Not Used
A2R60		Not Used
A2R61		Not Used

TABLE 7-8 (CONT'D)

REFERENCE DESIGNATION	MICRO-POWER PART NUMBER	DESCRIPTION
A2R62	300-152	1500 ohm 10% 1/4W Comp
A2R63	300-221	220 ohm 10% 1/4W Comp
A2R64	300-102	1000 ohm 10% 1/4W Comp
A2R65	300-682	6800 ohm 10% 1/4W Comp
A2R66	301-331	330 ohm 10% 1/2W Comp
A2R67	315-049	1910 ohm 1% 1/8W Met Film
A2R68	315-	To be determined
A2R69	300-471	470 ohm 10% 1/4W Comp
A2R70	315-057	8060 ohm 1% 1/8W Met Film
A2R71	315-061	10K ohm 1% 1/8W Met Film
A2R72		Not Used
A2R73		Not Used
A2R74		Not Used
A2R76	306-003	0.68 ohm 10% 1W Comp
A2R77	300-224	220K ohm 10% 1/4W Comp
A2R78	300-101	100 ohm 10% 1/4W Comp
A2R79	300-221	220 ohm 10% 1/4W Comp
A2R80	300-150	15 ohm 10% 1/4W Comp
A2R81	300-152	1500 ohm 10% 1/4W Comp
A2R82	315-088	15K ohm 1% 1/8W Met Film
A2R83	300-332	3300 ohm 10% 1/4W Comp
A2R84		Factory Selected
	233-007	Transistor Pad
	233-011	I.C. Socket 14 Pin

TABLE 7-9

ASSEMBLY A2
REPLACEABLE PARTS
TUNING & BIAS SUPPLY
(207-153)

REFERENCE SYMBOL	HICO-PLEX PART NUMBER	DESCRIPTION
A2	207-153	Tuning & Bias Supply
A2C1	440-013	2.2 uf 10% 20V Tant
A2C2	430-011	0.1 uf 10% 50V Mylar
A2C3	430-011	0.1 uf 10% 50V Mylar
A2C4		Not Used
A2C5	430-013	0.0033 uf 10% 600V Mylar
A2C6	430-027	0.01 uf 10% 50V Mylar
A2C7		Not Used
A2C8	430-027	0.01 uf 10% 50V Mylar
A2C9	430-011	0.1 uf 10% 50V Mylar
A2C10	460-330	33pf 10%
A2C11	430-032	0.22 uf 10% 50V Mylar
A2C12	430-017	0.047 uf 10% 50V Mylar
A2C13	420-035	0.002 uf 20% 1KV Cer
A2C14	400-043	10 uf -10+100% 25V Elect
A2C15	400-041	100 uf -10+100% 25V Elect
A2C16	460-221	220 pf 10% 500V Mica
A2C17	430-019	4700 pf 10% 50V Mylar
A2CR1		Not Used
A2CR2		Not Used
A2CR3		Not Used
A2CR4		Not Used
A2CR5		Not Used
A2CR6		Not Used
A2CR7		Not Used
A2CR8		Not Used
A2CR9		Not Used
A2CR10		Not Used
A2CR11		Not Used
A2CR12		Not Used
A2CR13		Not Used
A2CR14		Not Used
A2CR15		Not Used
A2CR16	500-010	Diode
A2CR17	500-010	Diode
A2CR18	501-013	Diode, Zener
A2CR19		Not Used
A2CR20	500-019	SCR
A2CR21		Not Used
A2CR22		Not Used
A2CR23	500-010	Diode
A2CR24	500-010	Diode

TABLE 7-9 (CONT'D)

REFERENCE DESIGNATION	MICRO-POWER PART NUMBER	DESCRIPTION
A2CR25	500-010	Diode
A2CR26	500-013	Diode
A2CR27	501-010	Diode
A2CR28		Not Used
A2CR29	500-010	Diode
A2CR30	500-010	Diode
A2CR31		Not Used
A2CR32	500-010	Diode
A2CR33	500-010	Diode
A2CR34	500-010	Diode
A2CR35	500-010	Diode
A2CR36	500-010	Diode
A2CR37	500-010	Diode
A2IC1	503-001	I.C. Amplifier
A2IC2	503-001	I.C. Amplifier
A2K1A	216-002	Relay Coil
A2K1B	211-014	Reed
A2Q1	502-024.	Transistor
A2Q2		Not Used
A2Q3	502-026	Transistor
A2Q4	502-010	Transistor
A2Q5	502-010	Transistor
A2Q6	502-031	Transistor
A2Q7	502-013	Transistor
A2Q8	502-013	Transistor
A2Q9	502-026	Transistor
A2Q10	502-005	Transistor
A2Q11	502-010	Transistor
A2R1		Not Used
A2R2		Not Used
A2R3		Not Used
A2R4		Not Used
A2R5		Not Used
A2R6		Not Used
A2R7		Not Used
A2R8		Not Used
A2R9		Not Used
A2R10		Not Used
A2R11		Not Used

TABLE 7-9 (CONT'D)

REFERENCE DESIGNATION	MICRO-POWER PART NUMBER	DESCRIPTION
A2R12	304-005	1000 ohm 10% 1/2W WW LinVar
A2R13		Not Used
A2R14		Not Used
A2R15		Not Used
A2R16		Not Used
A2R17		Not Used
A2R18		Not Used
A2R19		Not Used
A2R20		Not Used
A2R21		Not Used
A2R22		Not Used
A2R23		Not Used
A2R24		Not Used
A2R25		Not Used
A2R26		Not Used
A2R27		Not Used
A2R28		Not Used
A2R29		Not Used
A2R30		Not Used
A2R31		Not Used
A2R32		Not Used
A2R33		Not Used
A2R34	315-058'	9.09K ohm 1% 1/8W Met Film
A2R35	315-095	1.0 Meg ohm 1% 1/8W Met Film
A2R36	315-095	1.0 Meg ohm 1% 1/8W Met Film
A2R37	300-103	10K ohm 10% 1/4W Comp
A2R38	300-103	10K ohm 10% 1/4W Comp
A2R39	300-470	47 ohm 10% 1/4W Comp
A2R40	300-101	100 ohm 10% 1/4W Comp
A2R41	300-473	47K ohm 10% 1/4W Comp
A2R42	300-101	100 ohm 10% 1/4W Comp
A2R43	315-019	100K ohm 1% 1/8W Met Film
A2R44	300-470	47 ohm 10% 1/4W Comp
A2R45	300-102	1000 ohm 10% 1/4W Comp
A2R46	315-124	750K ohm 1% 1/8W Met Film
A2R47	300-103	10K ohm 10% 1/4W Comp
A2R48	300-100	10 ohm 10% 1/4W Comp
A2R49	315-055	2490 ohm 1% 1/8W Met Film
A2R50		Not Used
A2R51	315-061	10 K ohm 1% 1/8W Met Film
A2R52		Not Used
A2R53	315-061	10K ohm 1% 1/8W Met Film
A2R54	304-005	1000 ohm 10% 1/2W WW LinVar
A2R55	325-	To be determined

TABLE 7-9 (CONT'D)

REFERENCE DESIGNATION	MICRO-POWER PART NUMBER	DESCRIPTION
A2R56	325-004	15K ohm .05% 1/8W WW
A2R57		Not Used
A2R58		Not Used
A2R59		Not Used
A2R60		Not Used
A2R61		Not Used
A2R62	300-152	1500 ohm 10% 1/4W Comp
A2R63	300-221	220 ohm 10% 1/4W Comp
A2R64	315-026	1870 ohm 1% 1/8W Met Film
A2R65	300-682	6800 ohm 10% 1/4W Comp
A2R66	301-681	680 ohm 10% 1/2W Comp
A2R67	315-049	1910 ohm 1% 1/8W Met Film
A2R68	315-	To be determined
A2R69	300-471	470 ohm 10% 1/4W Comp
A2R70	315-057	8060 ohm 1% 1/8W Met Film
A2R71	315-061	10K ohm 1% 1/8W Met Film
A2R72	300-471	470 ohm 10% 1/4W Comp
A2R73		Not Used
A2R74		Not Used
A2R75	305-016	1 08 ohm 1% 3W WW
A2R76	300-027	2.7 ohm 10% 1/4W Comp
A2R77	300-224	220K ohm 10% 1/4W Comp
A2R78	300-101	100 ohm 10% 1/4W Comp
A2R79	300-221	220 ohm 10% 1/4W Comp
A2R80	300-150	15 ohm 10% 1/4W Comp
A2R81	300-152	1500 ohm 10% 1/4W Comp
A2R82	315-088	15K ohm 1% 1/8W Comp
A2R83	300-332	3300 ohm 10% 1/4W Comp
A2R84		Selected at test
A2R85	315-	6810 ohm 1% 1/8W Met Film
	233-007	Transistor Pad
	233-011	I.C. Socket 14 Pin

TABLE 7-10

ASSEMBLY A2
REPLACEABLE PARTS
TUNING & BIAS SUPPLY
(207-162)*

REFERENCE DESIGNATION	MICRO-POWER PART NUMBER	DESCRIPTION
A2	207-162	Tuning & Bias Supply
A2R34	315-005	6.98K Ohm 1/8W 1% Met Film
A2R49	315-045	2.37K Ohm 1/8W 1% Met Film
		*Same as 207-151 except for the parts listed above. See Table 7-8.

TABLE 7-11

ASSEMBLY A2
REPLACEABLE PARTS
TUNING & BIAS SUPPLY
(207-163)*

REFERENCE DESIGNATION	MICRO-POWER PART NUMBER	DESCRIPTION
A2	207-163	Tuning & Bias Supply
A2R34	315-018 & 315-010	7.346 K Ohms, consisting of 6.65 K Ohms in series with 698 Ohms. Both are 1/8 W, 1%, met film.
A2R49	315-014 & 315-081	1.613 K Ohms, consisting of 3.48 K Ohms in parallel with 3.01 K Ohms. Both are 1/8 W, 1%, met film.
		* Same as assembly 207-153 except for parts listed above. See Table 7-9.

TABLE 7-12

ASSEMBLY A3
REPLACEABLE PARTS
FM AMPLIFIER
(207-135)

REFERENCE DESIGNATION	MICRO-POWER PART NUMBER	DESCRIPTION			
A3	207-135	FM Amplifier			
A3C1	430-017	.047 uf	10%	50V	Mylar
A3C2	430-002	.001 uf	10%	600V	Mylar
A3C3	430-032	.22 uf	10%	50V	Mylar
A3C4	430-002	.001 uf	10%	600V	Mylar
A3CR1	500-001	Diode			
A3CR2	501-014	Diode, Zener			
A3F1	212-008	Fuse 0.25 AMP			
A3Q1	502-026	Transistor			
A3Q2	502-026	Transistor			
A3Q3	502-005	Transistor			
A3R1	305-071	78.7 ohm	3%	3W	WW
A3R2	315-054	1000 ohm	1%	1/8W	Met Film
A3R3	300-222	2200 ohm	10%	1/4W	Comp
A3R4	315-034	27.4K ohm	1%	1/8W	Met Film
A3R5	300-221	220 ohm	10%	1/4W	Comp
A3R6	300-332	3300 ohm	10%	1/4W	Comp
A3R7	300-222	2200 ohm	10%	1/4W	Comp
A3R8	300-100	10 ohm	10%	1/4W	Comp
A3R9	300-101	100 ohm	10%	1/4W	Comp
A3R10	300-472	4700 ohm	10%	1/4W	Comp

TABLE 7-13

ASSEMBLY A3
REPLACEABLE PARTS
FM AMPLIFIER
(207-152)

REFERENCE DESIGNATION	MICRO-POWER PART NUMBER	DESCRIPTION
A3	207-152	FM Amplifier
A3C1	430-017	.047uf 10% 50V Mylar
A3C2	430-002	.001uf 10% 600V Mylar
A3C3	430-017	.047uf 10% 50V Mylar
A3C4	430-002	.001uf 10% 600V Mylar
A3CR1	500-005	Diode
A3CR2	501-014	Diode, Zener
A3F1	212-005	Fuse 1.0 Amp
A3Q1	502-026	Transistor
A3Q2	502-026	Transistor
A3Q3	502-005	Transistor
A3R1		Not Used
A3R2	315-054	1000 ohm 1% 1/8W Met Film
A3R3	300-222	2200 ohm 10% 1/4W Comp
A3R4	315-034	27.4K ohm 1% 1/8W Met Film
A3R5	300-221	220 ohm 10% 1/4W Comp
A3R6	300-332	3300 ohm 10% 1/4W Comp
A3R7	300-222	2200 ohm 10% 1/4W Comp
A3R8	300-6R8	6.8 ohm 10% 1/4W Comp
A3R9	300-101	100 ohm 10% 1/4W Comp
A3R10	300-152	1500 ohm 10% 1/4W Comp

TABLE 7-14

ASSEMBLY A4
REPLACEABLE PARTS
R.F. ASSEMBLY
(250-027)

REFERENCE DESIGNATION	MICRO-POWER PART NUMBER	DESCRIPTION
A4	250-027	R.F. ASSEMBLY
A4A1	571-004	Oscillator/Diode Modulator (231A, -1 & -2)
A4A1	571-010	Oscillator without D.M. (231A-3)
A4A2	576-007	Diode Modulator (Option-3)
A4AT1	578-003	Isolator (Option-3)
A4CR1	576-008	Crystal Detector D114 (Option-1)
A4DC1	575-015	Directional Coupler (Option-1)
A4R1		Not Used
A4R2	305-046	147 ohm 3% 3W WW
A4R3	305-046	147 ohm 3% 3W WW
A4R4	300-332	3300 ohm 10% 1/4W Comp
A4W1	240-049	Cable Assy Semi-Rigid
A4W2	240-046	Cable Assy Semi-Rigid
A4W3	240-050	Cable Assy Semi-Rigid
	205-231	Chassis, R.F. Comp
	205-230	Bracket
	205-272	Plate, Support
	234-051	Conn. Adapter "SMA" M/M (Option-3)

TABLE 7-15

ASSEMBLY A4
REPLACEABLE PARTS
R. F. ASSEMBLY
(250-028)

REFERENCE DESIGNATION	MICRO-POWER PART NUMBER	DESCRIPTION
A4	250-028	R.F. Assembly
A4A1	571-012	Oscillator (Model 232A)
A4A1	571-011	Oscillator (Model 242A)
A4A2	576-007	Diode Modulator
A4CR1	576-008	Crystal Detector D114 (Option-1)
A4CR2		Not Used
A4CR3		Not Used
A4CR4	501-025	Diode, Zener
A4CR5	501-024	Diode, Zener
A4DC1	575-014	Directional Coupler (Option-1)
A4J3	234-035	Connector, P.C. 15 Pin
A4R1	326-68R1	68.1 ohm 1% 10W WW
A4W1	240-047	Cable Assy Semi-Rigid
A4W2	240-046	Cable Assy
	205-231	Chassis, R.F. Comp
	205-230	Bracket
	205-228	Clamp Support
	205-229	Clamp Support
	234-051	Conn. Adapter "SMA" M/M (Option-1)

TABLE 7-16

ASSEMBLY A4
REPLACEABLE PARTS
R. F. ASSEMBLY
(250-030)

REFERENCE DESIGNATION	MICRO-POWER PART NUMBER	DESCRIPTION
A4	250-030	RF Assembly
A4A1	571-007	Oscillator
A4A2	576-007	Diode Modulator
A4AT1	578-006	Isolator, 8-12.4 GHz
A4CR1	576-012	Crystal Detector, HD113 (Option-1)
A4CR5		Diode, Zener (Factory Selected)
A4DC1	575-004	Directional Coupler
A4J3	234-035	Connector P.C. 15 Pin
A4R1	326-150	15 ohm 1% 25W WW
A4W1	240-063	Cable Assembly - Semi-Rigid
A4W2	240-046	Cable Assembly - Semi-Rigid
A4W3		Not Used
	234-057	Conn. Adapter "M" to "N"
	205-231	Chassis - RF Component
	205-282	Bracket, Support
	205-229	Clamp Support
	234-051	Conn. Adapter "SMA" M/M
	205-230	Bracket

TABLE 7-17

ASSEMBLY A4
REPLACEABLE PARTS
R. F. ASSEMBLY
(250-031)

REFERENCE DESIGNATION	MICRO-POWER PART NUMBER	DESCRIPTION
A4	250-031	R.F. ASSEMBLY
A4A1	571-005	Solid State Osc. Heterdyne
A4A2		Not Used
A4A3	250-035	.01-1 GHz Amplifier
A4A4	580-005	Mixer
A4AT1	573-006	Attenuator - "SMA" Conn.
A4AT2	573-007	Termination
A4CR1	576-008	Crystal Detector D114
A4CR2	500-010	Diode
A4DC1	575-015	Directional Coupler
A4J1	234-061	Connector Receptacle 24 Pin
A4K1	210-040	Relay, Coax
A4R1	304-034	1000 ohm 20% 1/4W WW Var
A4R2	304-005	1000 ohm 10% 1/2W WW Var
A4R3	300-101	100 ohm 10% 1/4W Comp
A4R4	300-500	50 ohm 10% 1/4W Comp
A4R5	305-046	147 ohm 3% 3W WW
A4R6	305-046	147 ohm 3% 3W WW
A4R7	300-100	10 ohm 3% 3W WW
A4R8		Selected at test
A4R9	300-332	3300 ohm 10% 1/4W Comp
A4R10		Selected at test

TABLE 7-18

ASSEMBLY A4
REPLACEABLE PARTS
R. F. ASSEMBLY
(250-053)

REFERENCE DESIGNATION	MICRO-POWER PART NUMBER	DESCRIPTION
A4	250-053	R.F. ASSEMBLY
A4A1	571-005	Solid State Osc.-Heterdyne
A4A2		Not Used
A4A3	250-035	.01-1GHz Amplifier
A4A4	580-005	Mixer
A4AT2	573-007	Termination
A4CR1	576-008	Crystal Detector D114
A4CR2	500-010	Diode
A4DC1	575-015	Directional Coupler
A4J1	234-061	Connector Receptacle 24 Pin
A4K1	210-040	Relay, Coax
A4R1	304-039	1K/1K ohm 20% 1/2W WW Var Tandem
A4R2		P/O R1
A4R3	300-101	100 ohm 10% 1/4W Comp
A4R4		Not Used
A4R5	305-046	147 ohm 3% 3W WW
A4R6	305-046	147 ohm 3% 3W WW
A4R7	300-100	10 ohm 10% 1/4W Comp
A4R8		Selected at test
A4R9	300-332	3300 ohm 10% 1/4W Comp
A4R10		Selected at test

TABLE 7-19

ASSEMBLY A4
REPLACEABLE PARTS
R. F. ASSEMBLY
(250-056)

REFERENCE DESIGNATION	MICRO-POWER PART NUMBER	DESCRIPTION
A4	250-056	R.F. ASSEMBLY
A4A1	571-013	Oscillator
A4A2	576-007	Diode Modulator
A4AT1	578-006	Isolator, 8-12.4 GHz
A4CR1	576-012	Crystal Detector, HD113
A4DC1	575-004	Directional Coupler
A4J3	234-035	Connector P.C. 15 Pin
A4R1	326-150	15 ohm 1 % 25W WW
A4W1	240-063	Cable Assembly-Semi Rigid
A4W2	240-046	Cable Assembly-Semi Rigid
A4W3		Not Used
	234-057	Conn. Adapter "N" to "SMA"
	205-231	Chassis - R.F. Component
	204-097	Heatsink Top
	204-098	Heatsink, Bottom
	201-060	Terminal, Solderless
	234-051	Conn. Adapter "SMA" M/M
	201-048	Spacer
	839-701	Lug, Solder
	205-230	Bracket
A4CR4		Diode, Zener (Factory Selected)
A4CR5		Diode, Zener (Factory Selected)

TABLE 7-20

ASSEMBLY A4
REPLACEABLE PARTS
R.F.ASSEMBLY
(250-062)*

REFERENCE DESIGNATION	MICRO-POWER PART NUMBER	DESCRIPTION
A4	250-062	R.F. Assembly
A4A1	571-008	Oscillator
A4A2	576-007	Diode Modulator
A4AT1	578-008	Isolator
A4CR1		NOT USED
A4CR5		Diode Zener (Factory Selected)
A4W2	240-063	Cable Assembly
A4R1	326-151	8 Ohm 1% 25 WW
		*Same as 250-030 except for the parts listed above. See Table 7-16.

TABLE 7-21

ASSEMBLY A4
REPLACEABLE PARTS
R.F. ASSEMBLY
(250-064)

REFERENCE DESIGNATION	MICRO-POWER PART NUMBER	DESCRIPTION
A4	250-064	R. F. Assembly
A4A1	571-014	Oscillator
A4A2	576-007	Diode Modulator
A4AT1	578-008	Isolator, 12.4-18GHz
A4CR1	576-012	Crystal Detector, HD113
A4CR4		Diode (Factory Selected)
A4CR5		Diode (Factory Selected)
A4DC1	575-004	Directional Coupler
A4J3	234-035	Connector P.C., 15 pin
A4R1	326-151	8 Ohms 1%, 25 w ww
A4W1	240-063	Cable Assembly, semi-rigid
A4W2	240-064	Cable Assembly, semi-rigid
A4W2P1	234-032	Connector, plug SMA
A4W2P2	234-058	Connector, plug SMA
	234-057	Conn. Adapter "N" to "SMA"
	205-231	Chassis - R. F. Component
	204-097	Heatsink Top
	204-098	Heatsink, Bottom
	201-060	Terminal, Solderless
	234-051	Conn. Adapter "SMA" M/M
	201-048	Spacer
	839-701	Lug, Solder
	205-230	Bracket

TABLE 7-22

ASSEMBLY A5
REPLACEABLE PARTS
SYM SWP SWITCH
(250-008)

REFERENCE DESIGNATION	MICRO-POWER PART NUMBER	DESCRIPTION
A5	250-008	Symmetrical Sweep Switch Assy
A5S1	210-025	Switch
A5R1	P/O 210-025	10K ohm Pot
A5R2	315-015	6980 ohm 1% 1/8W Met Film
A5R3	315-014	3480 ohm 1% 1/8W Met Film
A5R4	315-011	1400 ohm 1% 1/8W Met Film
A5R5	315-010	698 ohm 1% 1/8W Met Film
A5R6	315-009	348 ohm 1% 1/8W Met Film
A5R7	315-006	140 ohm 1% 1/8W Met Film
A5R8	315-005	69.8 ohm 1% 1/8W Met Film
A5R9	315-004	34.8 ohm 1% 1/8W Met Film
A5R10	315-001	14.0 ohm 1% 1/8W Met Film

TABLE 7-23

ASSEMBLY A5
REPLACEABLE PARTS
SYM SWP SWITCH
(250-011)

REFERENCE DESIGNATION	MICRO-POWER PART NUMBER	DESCRIPTION
A5	250-011	Symmetrical Sweep Switch Assy
A5S1	210-025 P/O	Switch
A5R1	210-025	10K ohm Pot
A5R10	315-002	17.4 ohm 1% 1/8W Met Film
A5R9	315-004	34.8 ohm 1% 1/8W Met Film
A5R8	315-005	69.8 ohm 1% 1/8W Met Film
A5R7	315-007	174 ohm 1% 1/8W Met Film
A5R6	315-009	348 ohm 1% 1/8W Met Film
A5R5	315-010	698 ohm 1% 1/8W Met Film
A5R4	315-012	1740 ohm 1% 1/8W Met Film
A5R3	315-014	3480 ohm 1% 1/8W Met Film
A5R2	315-015	6980 ohm 1% 1/8W Met Film

TABLE 7-24

ASSEMBLY A5
REPLACEABLE PARTS
SYM SWP SWITCH
(250-032)

REFERENCE DESIGNATION	MICRO-POWER PART NUMBER	DESCRIPTION
A5	250-032	Symmetrical Sweep Switch Ass'y
A5S1	210-025 P/O	Switch
A5R1	210-025	10K ohm Pot
A5R2	315-015	6980 ohm 1% 1/8W Met Film
A5R3	315-014	3480 ohm 1% 1/8W Met Film
A5R4	315-011	1400 ohm 1% 1/8W Met Film
A5R5	315-010	698 ohm 1% 1/8W Met Film
A5R6	315-009	348 ohm 1% 1/8W Met Film
A5R7	315-006	140 ohm 1% 1/8W Met Film
A5R8	315-005	69.8 ohm 1% 1/8W Met Film
A5R9	315-004	34.8 ohm 1% 1/8W Met Film
A5R10	315-001	14.0 ohm 1% 1/8W Met Film

TABLE 7-25

ASSEMBLY A5
REPLACEABLE PARTS
SYM SWP SWITCH
(250-043)

REFERENCE DESIGNATION	MICRO-POWER PART NUMBER	DESCRIPTION
A5	250-043	Symmetrical Sweep Switch Assy
	P/O	
A5R1	210-025	10K ohm Pot
A5R2	315-015	6980 ohm 1% 1/8W Met Film
A5R3	315-013	2800 ohm 1% 1/8W Met Film
A5R4	315-011	1400 ohm 1% 1/8W Met Film
A5R5	315-010	698 ohm 1% 1/8W Met Film
A5R6	315-008	280 ohm 1% 1/8W Met Film
A5R7	315-006	140 ohm 1% 1/8W Met Film
A5R8	315-005	69.8 ohm 1% 1/8W Met Film
A5R9	315-003	28.0 ohm 1% 1/8W Met Film
A5R10	315-001	14.0 ohm 1% 1/8W Met Film
A5S1	210-025	Switch, Rotary

TABLE 7-26

ASSEMBLY A5
REPLACEABLE PARTS
SYM SWP SWITCH
(250-051)

REFERENCE DESIGNATION	MICRO-POWER PART NUMBER	DESCRIPTION
A5	250-051	Symmetrical Sweep Switch Ass'y
A5S1	210-025 P/O	Switch
A5R1	210-025	10K ohm Pot
A5R10	315-127	15.8 ohm 1% 1/8W Met Film
A5R9	315-128	31.6 ohm
A5R8	315-129	63.4 ohm 1% 1/8W Met Film
A5R7	315-130	158 ohm 1% 1/8W Met Film
A5R6	315-131	316 ohm 1% 1/8W Met Film
A5R5	315-132	634 ohm 1% 1/8W Met Film
A5R4	315-133	1580 ohm 1% 1/8W Met Film
A5R3	315-027	3160 ohm 1% 1/8W Met Film
A5R2	315-134	6340 ohm 1% 1/8W Met Film

TABLE 7-27

ASSEMBLY A5
REPLACEABLE PARTS
SYM SWP SWITCH
(250-052)

REFERENCE DESIGNATION	MICRO-POWER PART NUMBER	DESCRIPTION
A5	250-052	Symmetrical Sweep Switch Assembly
A5S1	210-025	Switch
A5R1	P/O 210-025	10K Pot
A5R2	315-096	6190 ohm 1% 1/8W Met Film
A5R3	315-055	2490 ohm 1% 1/8W Met Film
A5R4	315-040	1270 ohm 1% 1/8W Met Film
A5R5	315-123	619 ohm 1% 1/8W Met Film
A5R6	315-135	249 ohm 1% 1/8W Met Film
A5R7	315-136	127 ohm 1% 1/8W Met Film
A5R8	315-137	61.9 ohm 1% 1/8W Met Film
A5R9	315-138	24.9 ohm 1% 1/8W Met Film
A5R10	315-139	12.7 ohm 1% 1/8W Met Film

TABLE 7-28

ASSEMBLY A6
REPLACEABLE PARTS
LEVELER SWITCH
(250-012)

REFERENCE DESIGNATION	MICRO-POWER PART NUMBER	DESCRIPTION
A6	250-012	Leveler Switch
A6S1	210-029	Switch
A6R1	300-103	10K ohm 10% 1/4W Comp

TABLE 7-29

ASSEMBLY A6
REPLACEABLE PARTS
LEVELER SWITCH
(250-046)

REFERENCE DESIGNATION	MICRO-POWER PART NUMBER	DESCRIPTION
A6	250-046	Leveler Switch
A6S1	210-042	Switch
A6R1	300-203	20K ohm 10% 1/4W Comp
A6R2	300-222	2200 ohm 10% 1/4W Comp
A6R3	300-222	2200 ohm 10% 1/4W Comp
A6R4		Selected at test
A6C1	440-044	220 uf 10% 10V Tant
A6C2	440-044	220 uf 10% 10V Tant

TABLE 7-30

ASSEMBLY A7
REPLACEABLE PARTS
BASIC PLUG-IN ASSY
(250-007)

REFERENCE DESIGNATION	MICRO-POWER PART NUMBER	DESCRIPTION
A7	250-007	Basic Plug-in Assy
A7C1		See Table 7-33
A7CR1	500-005	Diode
A7CR2	500-010	Diode
A7DS1	214-006	Lamp, Indicator
A7F1		Fuse (see Table 7-33)
A7J1	234-0D	Connector, P.C. 24 Pin
A7J2	234-019	Connector, P.C. 24 Pin
A7J3	234-003	Connector BNC
A7J4		Not Used
A7J5	234-003	Connector BNC
A7J6	234-003	Connector BNC
A7J7	234-003	Connector BNC
A7J8	234-003	Connector BNC
A7P1	234-054	Connector, Plug 36 Pin
A7Q1	502-030	Transistor (see Table 7-33)
A7Q2	502-019	Transistor (see Table 7-33)
A7R1	304-044	10K/10K ohm 20% 1W Tandem
A7R2		P/O A7R1
A7R3	304-036	1000 ohm 10% 1/2W WW LinVar
A7R4	300-470	47 ohm 10% 1/4W Comp
A7R5		See Table 7-33
A7R6		See Table 7-33
A7R7		See Table 7-33
A7R8		Not Used
A7R9		Not Used
A7R10		Not Used
A7R11		Not Used
A7R12	305-018	2.08 ohm 1% 3W WW
A7R13	300-100	10 ohm 10% 1/4W Comp (see Table 7-33)
A7R14		See Table 7-33
A7TB1		Not Used
A7TB2	236-004	Terminal Block & Contact
A7TB3	236-004	Terminal Block & Contact
A7W1	242-002	Harness
A7W2	240-048	Cable Assembly
	205-240	Panel, Front

TABLE 7-30 (CONT'D)

REFERENCE DESIGNATION	MICRO-POWER PART NUMBER	DESCRIPTION
	205-241	Panel, Rear
	205-234	Bracket, Connector
	205-289	Chassis, P.C. BD's
	205-235	Cover, Top
	205-236	Cover, Bottom
	205-237	Side Panel, Rt
	205-238	Side Panel, Lt
	205-239	Support, Center
	205-292	Bracket, BNC
	217-015	Knob, Rd, Skirt
	217-016	Knob, Rd, Skirt Conc
	217-012	Knob, Rd
	217-014	Knob, Rd
	201-050	Plug Button
	201-049	Plug Button
	228-003	Lock

TABLE 7-31

ASSEMBLY A7
REPLACEABLE PARTS
BASIC PLUG-IN ASSY.
(250-036)

REFERENCE DESIGNATION	MICRO-POWER PART NUMBER	DESCRIPTION
A7	250-036	Basic Plug-In Assembly
A7A1	571-006	1.2 GHz Fixed Osc.-Filter
A7A2	250-045	Freq. Range Sw. Assy (see Table 7-34)
A7CR1	500-005	Diode
A7CR2	500-010	Diode
A7CR3	500-010	Diode
A7CR4	500-010	Diode
A7DS1	214-006	Lamp, Indicator
A7F1	212-005	Fuse 1 Amp
A7J1	234-019	Connector P.C. 24 Pin
A7J2	234-019	Connector P.C. 24 Pin
A7J3	234-003	Connector, "BNC"
A7J4		Not Used
A7J5	234-003	Connector, "BNC"
A7J6	234-003	Connector, "BNC"
A7J7	234-003	Connector, "BNC"
A7J8	234-003	Connector, "BNC"
A7J9	234-003	Connector, "BNC"
A7K1	211-015	Relay
A7K2	210-040	Relay, Coax Switch
A7P1	234-054	Connector Plug 36 Pin
A7P2	234-062	Connector Plug 24 Pin
A7Q1	502-030	Transistor
A7Q2		Not Used
A7R1		Not Used
A7R2		Not Used
A7R3	304-036	1000 ohm 10% 1/2W WW LinVar
A7R4	300-470	47 ohm 10% 1/4W Comp
A7R5		Not Used
A7R6		Not Used
A7R7	315-076	44.2K ohm 1% 1/8W Met Film
A7R8		Not Used
A7R9		Selected at test

TABLE 7-31 (CONT'D)

REFERENCE DESIGNATION	MICRO-POWER PART NUMBER	DESCRIPTION
A7R10		Not Used
A7R11		Not Used
A7R12	305-018	2.08 ohm 1% 3W WW
A7R13	300-100	10 ohm 10% 1/4W Comp
A7R14	306-003	0.68 ohm 10% 1W Comp
A7R15AB	301-681	680 ohm 10% 1/2W Comp
A7R16	304-029	50K ohm 10% 1/2W WW LinVar
A7TB1		Not Used
A7TB2		Not Used
A7TB3	236-004	Terminal Block 8 Contacts

TABLE 7-32

ASSEMBLY A7
REPLACEABLE PARTS
BASIC PLUG-IN ASSY
(250-054)

REFERENCE DESIGNATION	MICRO-POWER PART NUMBER	DESCRIPTION
A7	250-054	Basic Plug-In Assembly
A7A1	571-006	1.2 GHz Fixed Osc.-Filter
A7A2	250-045	Freq. Range Sw. Assy (see Table 7-34)
A7CR1	500-005	Diode
A7CR2	500-010	Diode
A7CR3	500-010	Diode
A7CR4	500-010	Diode
A7DS1	214-006	Lamp, Indicator
A7F1	212-005	Fuse 1 Amp
A7J1	234-019	Connector P.C. 24 Pin
A7J2	234-019	Connector P.C. 24 Pin
A7J3	234-003	Connector, "BNC"
A7J4		Not Used
A7J5	234-003	Connector BNC
A7J6	234-003	Connector BNC
A7J7	234-003	Connector BNC
A7J8	234-003	Connector BNC
A7J9	234-003	Connector BNC
A7K1	211-015	Relay
A7K2	210-040	Relay, Coax Switch
A7P1	234-054	Connector Plug 36 Pin
A7P2	234-062	Connector Plug 24 Pin
A7Q1	502-030	Transistor
A7Q2		Not Used
A7R1		Not Used
A7R2		Not Used
A7R3	304-036	1000 ohm 10% 1/2W WW LinVar
A7R4	300-101	100 ohm 10% 1/4W Comp
A7R5		Not Used
A7R6		Not Used
A7R7	315-076	44.2K ohm 1% 1/8W Met Film
A7R8		Not Used
A7R9		Selected at test

TABLE 7-32 (CONT'D)

REFERENCE DESIGNATION	MICRO-POWER PART NUMBER	DESCRIPTION
A7R10		Not Used
A7R11		Not Used
A7R12	305-018	2.08 ohm 1% 3W WW
A7R13	300-100	10 ohm 10% 1/4W Comp
A7R14	306-003	0.68 ohm 10% 1W Comp
A7R15	301-681	680 ohm 10% 1/2W Comp
A7R16	304-029	50K ohm 10% 1/2W WW LinVar
A7TB1		Not Used
A7TB2		Not Used
A7TB3	236-004	Terminal Block 8 Contacts

TABLE 7-33

MODEL/COMPONENT CROSS REFERENCE
FOR ASSEMBLY A7(250-007)

MODEL	A7F1	A7Q1	A7Q2	A7R5	A7R6	A7R7	A7R13	A7R14	A7C1
231A	1 Amp 212-005	USED	NOT USED	NOT USED	NOT USED	44.2K Ohm 315-076	10 Ohm 300-100	.68 Ohm 306-003	NOT USED
232A	.25 Amp 212-008	USED	USED	10 Ohm 300-100	22 Ohm 303-220	69.8K Ohm 315-037	10 Ohm 300-100	.68 Ohm 306-003	100 pf 460-101
242A	.25 Amp 212-008	USED	USED	10 Ohm 300-100	22 Ohm 303-220	69.8K Ohm 315-037	10 Ohm 300-100	.68 Ohm 306-003	100 pf 460-101
234A(WJ) 235A(WJ)	1.5 Amp 212-007	NOT USED	USED	10 Ohm 300-100	305-019 5.55 Ohm 305-018 2.08 Ohm	49.9K Ohm 315-020	NOT USED	NOT USED	100 pf 460-101
234A(VA) 235A(VA)	1.0 Amp 212-005	USED	USED	10 Ohm 300-100	5.5 Ohm 305-019 2.08 Ohm 305-018	49.9K Ohm 315-020	10 Ohm 300-100	1.73 Ohm 305-015	100 pf 460-101
238A	1.0 Amp 212-005	USED	NOT USED	NOT USED	NOT USED	44.2K Ohm 315-076	10 Ohm 300-100	.68 Ohm 306-003	NOT USED
238B	1.0 Amp 212-005	USED	NOT USED	NOT USED	NOT USED	44.2K Ohm 315-076	10 Ohm 300-100	.68 Ohm 306-003	NOT USED

NOTE: Micro-Power Division Part No. given below value.

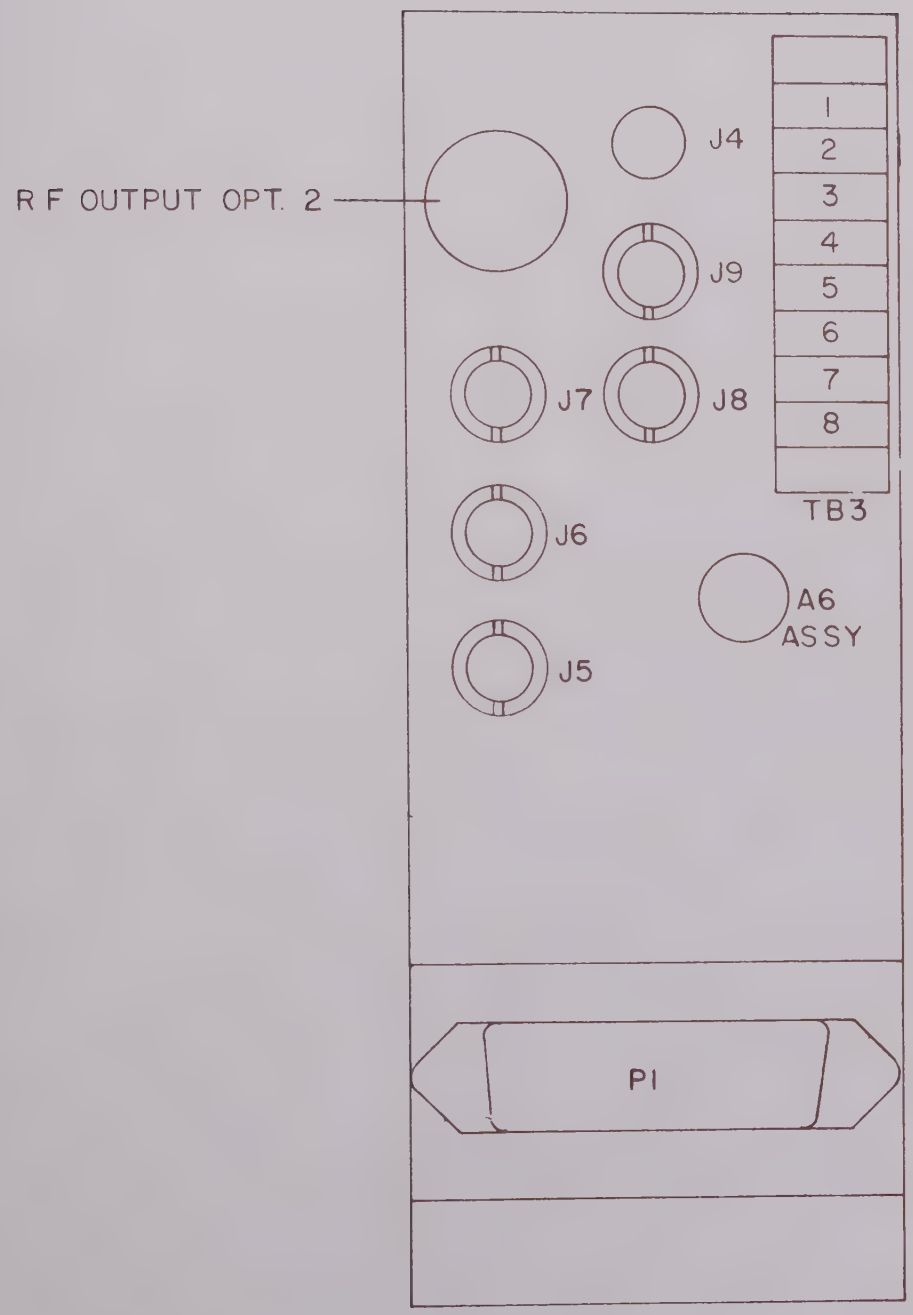
TABLE 7-34

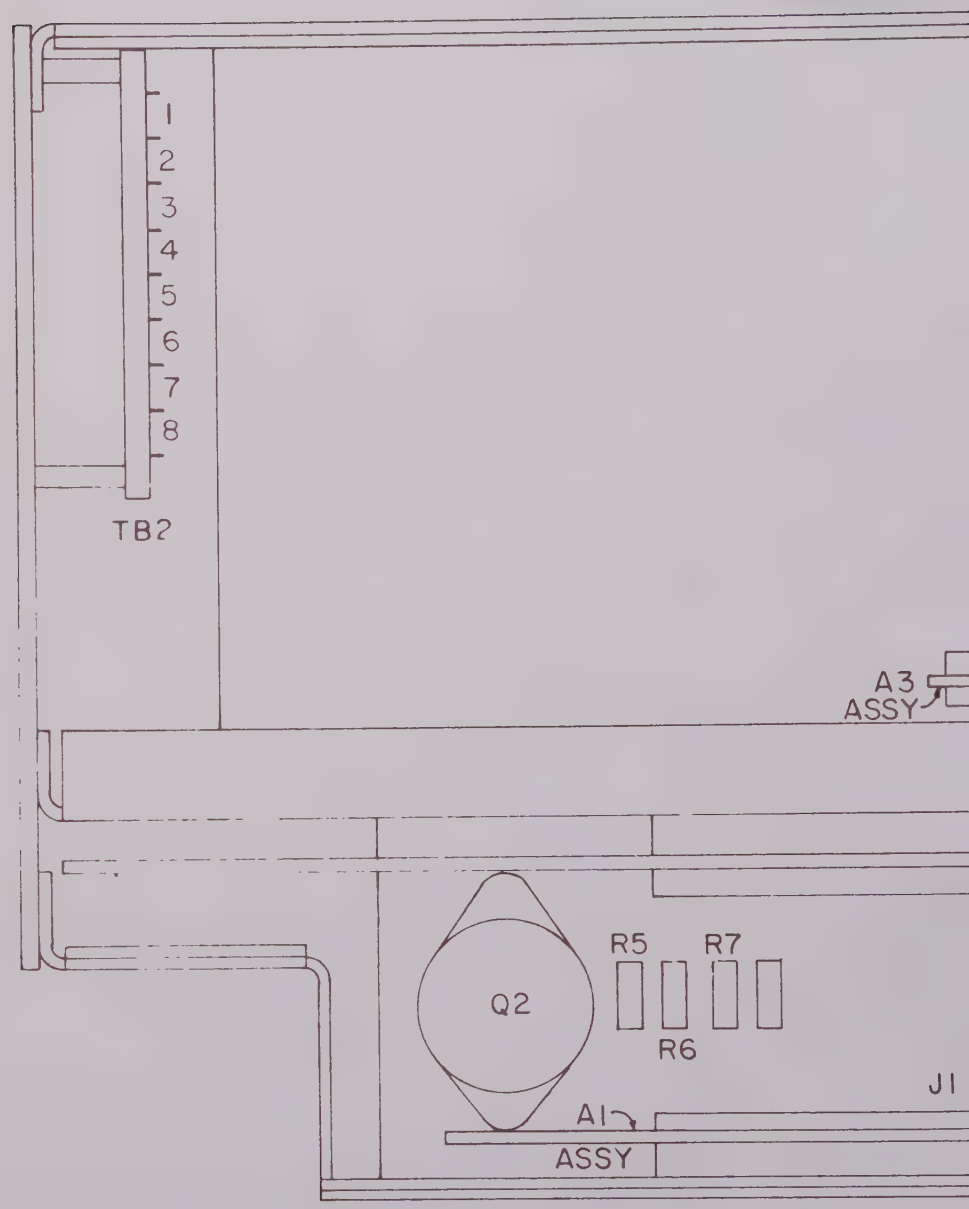
ASSEMBLY A7A2
REPLACEABLE PARTS
FREQ. RANGE SW. ASSY
(250-045)

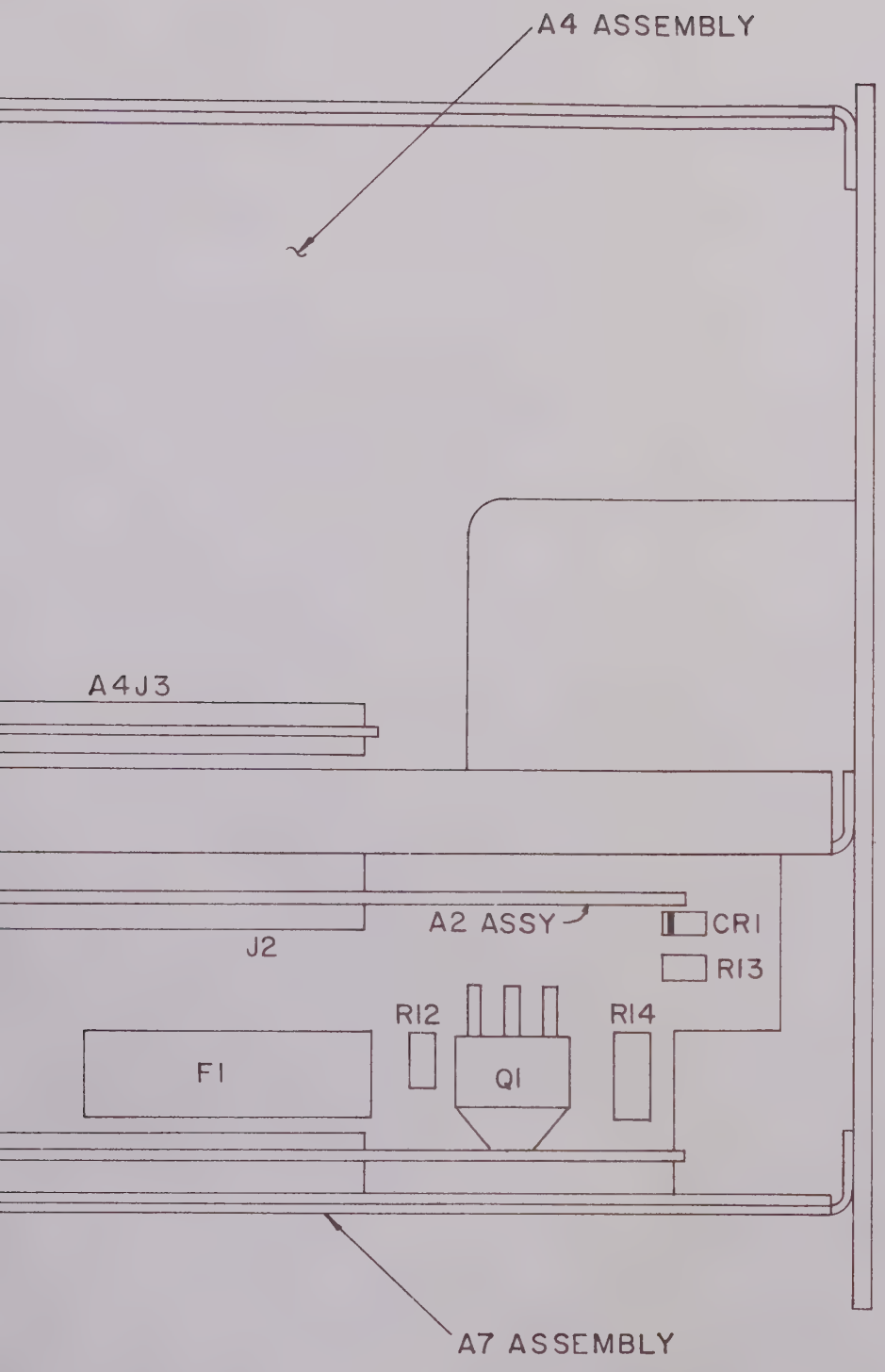
REFERENCE DESIGNATION	MICRO-POWER PART NUMBER	DESCRIPTION
A7A2	250-045	Frequency Range Sw. Assy
A7A2R1	300-472	4700 ohm 10% 1/4W Comp
A7A2S1	210-035	Switch, Rotary SP3T

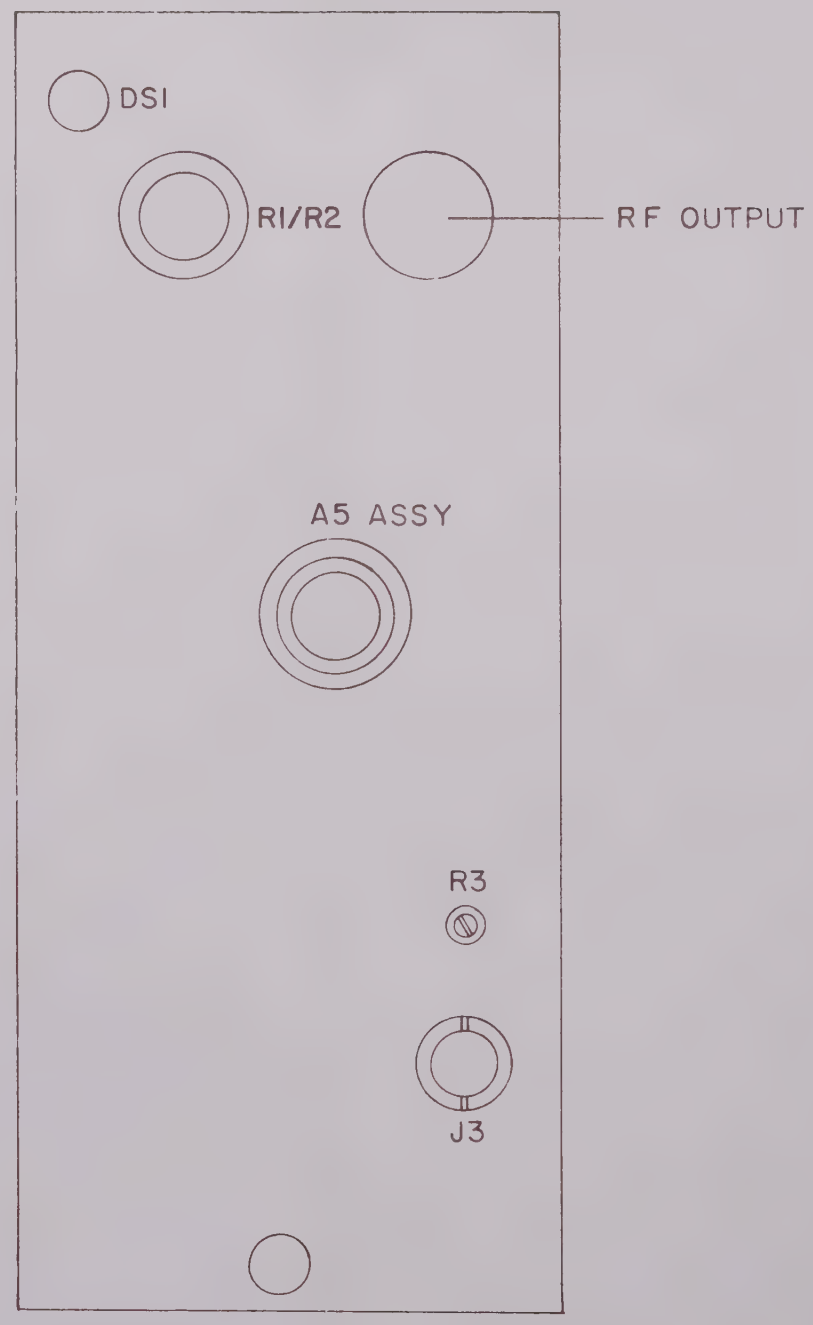
SECTION 8-0

ASSEMBLY DRAWINGS
AND
SCHEMATICS


RF OUTPUT OPT. 2
J4
J9
J7
J8
J6
J5
A6
ASSY
1
2
3
4
5
6
7
8
TB3
P1


1
2
3
4
5
6
7
8
TB2
A3
ASSY
R5
R7
R6
Q2
J1
A1
ASSY





FRONT PANEL

FIG. 8-1

ASSEMBLY LOCATION

RF UNIT

TABLE 8-1

(FOR SYMBOLS NOT SHOWN IN THIS TABLE REFER TO MIL-STD-15)

SEMICONDUCTORS

DIODE, SEMICONDUCTOR

BREAKDOWN DIODE, UNIDIRECTIONAL

TRANSISTOR, NPN

TRANSISTOR, PNP

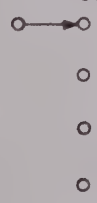
TRANSISTOR, FET

CAPACITIVE DIODE

CRYSTAL

SCR

SWITCHES



SWITCH, MULTIPOSITION NON-SHORTING

INPUTS, OUTPUTS & TERMINATIONS

SEPARABLE CONNECTORS (ENGAGED)

SIGNAL RETURN GROUND

LIKE DESIGNATED CIRCUIT RETURNS WITHIN A SINGLE SCHEMATIC ARE CONNECTED

CONTROLS & ADJUSTMENTS

SCREWDRIVER ADJUSTMENT

TEST POINT

ADJUSTMENT OR CONTROL LOCATED ON FRONT PANEL

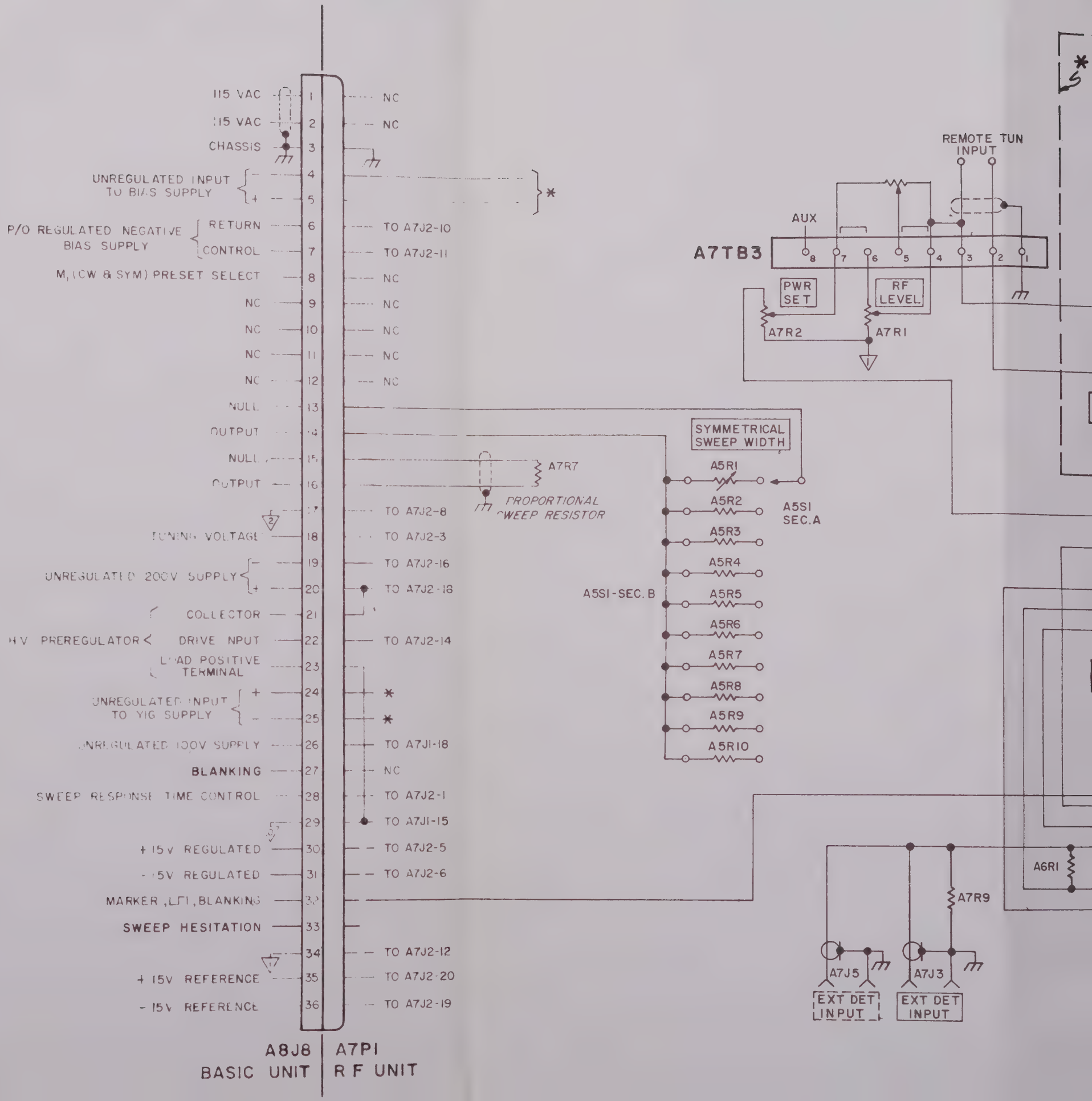
ADJUSTMENT OR CONTROL LOCATED ON REAR PANEL

MISCELLANEOUS

SIGNAL PATH

FEEDBACK OR SUBSIDIARY SIGNAL PATH

NOTE: UNLESS OTHERWISE SPECIFIED, ALL CAPACITANCES ARE IN PICOFARADS, INDUCTANCES IN MICROHENRIES, AND RESISTANCES IN OHMS, 1/4 W, 10%


115 VAC 1
115 VAC 2
CHASSIS 3
UNREGULATED INPUT TO BIAS SUPPLY 4 5
P/O REGULATED NEGATIVE BIAS SUPPLY RETURN 6
CONTROL 7
M1 (CW & SYM) PRESET SELECT 8
NC 9
NC 10
NC 11
NC 12
NULL 13
OUTPUT 14
NULL 15
OUTPUT 16
17
TUNING VOLTAGE 18
UNREGULATED 200V SUPPLY 19 20
COLLECTOR 21
H.V. PREREGULATOR DRIVE INPUT 22
LEAD POSITIVE TERMINAL 23
UNREGULATED INPUT TO YIG SUPPLY 24 25
UNREGULATED 100V SUPPLY 26
BLANKING 27
SWEEP RESPONSE TIME CONTROL 28
29
+15V REGULATED 30
-15V REGULATED 31
MARKER, LFI, BLANKING 32
SWEEP HESITATION 33
34
+15V REFERENCE 35
-15V REFERENCE 36
NC
NC
TO A7J2-10
TO A7J2-11
NC
NC
NC
NC
NC
A7R7
PROPORTIONAL SWEEP RESISTOR
TO A7J2-8
TO A7J2-3
TO A7J2-16
TO A7J2-18
TO A7J2-14
*
*
TO A7J1-18
NC
TO A7J2-1
TO A7J1-15
TO A7J2-5
TO A7J2-6
TO A7J2-12
TO A7J2-20
TO A7J2-19
A8J8 BASIC UNIT
A7P1 R F UNIT
SYMMETRICAL SWEEP WIDTH
A5R1
A5R2
A5R3
A5R4
A5R5
A5R6
A5R7
A5R8
A5R9
A5R10
A5SI SEC.A
A5SI-SEC. B
REMOTE TUN INPUT
AUX
A7TB3
8 7 6 5 4 3 2 1
PWR SET
RF LEVEL
A7R2
A7R1
A6R1
A7R9
A7J5
A7J3
EXT DET INPUT
EXT DET INPUT

SEE NOTES

TV
BIAS
CASE

RF OSCILLATOR
A4A1

DIODE MODULATOR

DIRECTIONAL COUPLER

RF OUTPUT

CRYSTAL DETECTOR

A7TB2

8 7 6 5 4 3 2 1

A7J2(A2 ASS'Y)

24 20 15 10 5 1

A4J3 (A3 ASS'Y)

15 10 5 1

A7J6

FM INPUT

A7J1
(A1 ASS'Y)

24 20 15 10 5 1

DS1

UNLEVELED

LEVELER MODE

A6S1

INT
EXT
OFF
XTAL

A6S1 SEC. A1

A6S1 SEC. B2

A6S1 SEC. B1

A6S1 SEC. A2

A6S1 SEC. B3

–
+
PWR MTR

A7R3

GAIN

A7R4

A6R2

A6R3

A6C1

A6C2

A6R4

A7J8

AM INPUT

A7CR2

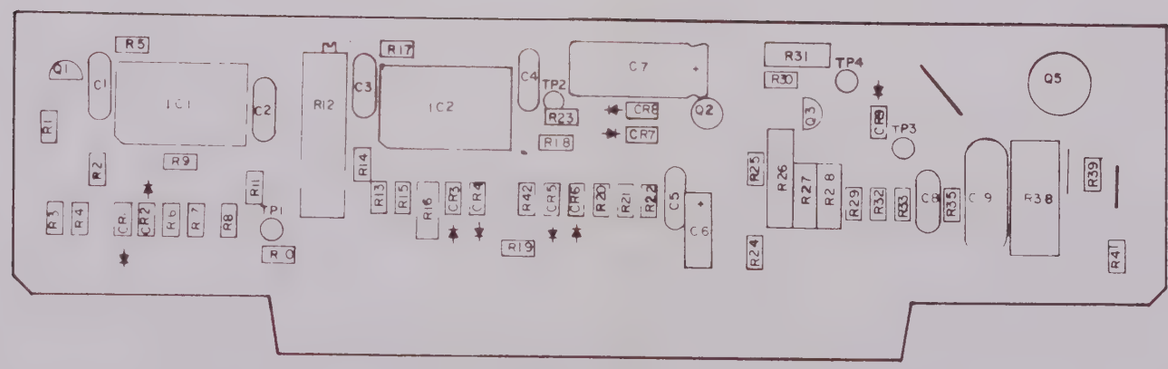
A7J7

AM PULSE

✱ – FOR DETAILED CONNECTIONS SEE INDIVIDUAL TUNING AND BIAS SUPPLY SCHEMATICS

FIG. 8-2

RF UNIT SCHEMATIC
FOR TYPE B LEVELER

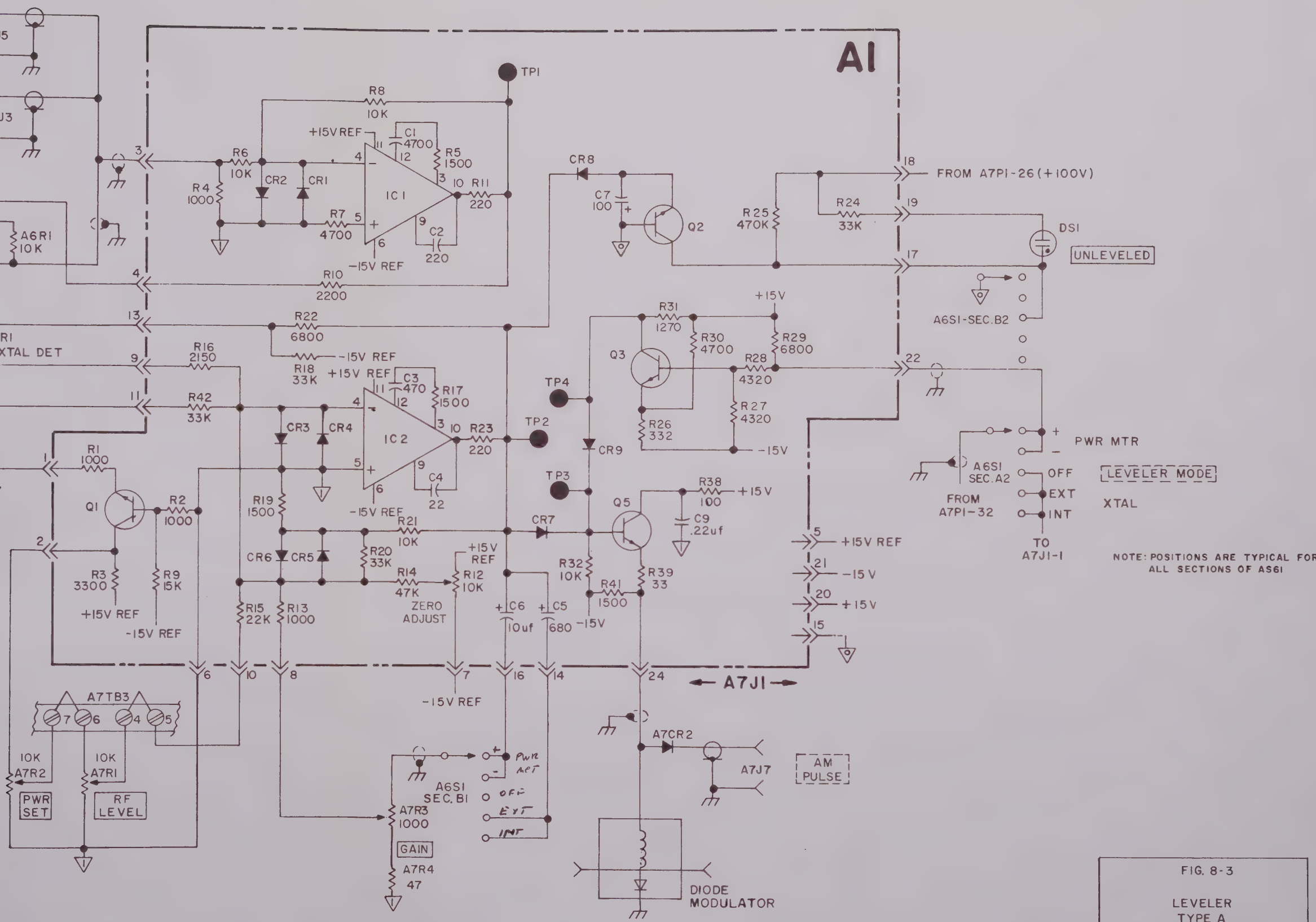


AI ASSEMBLY

A6S1
SEC. AI

AM
INPUT

FROM A6S

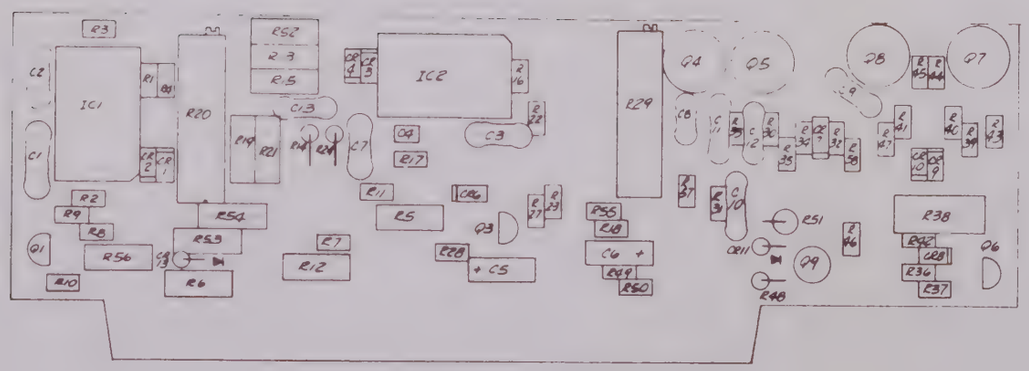


NOTE: POSITIONS ARE TYPICAL FOR ALL SECTIONS OF A6I

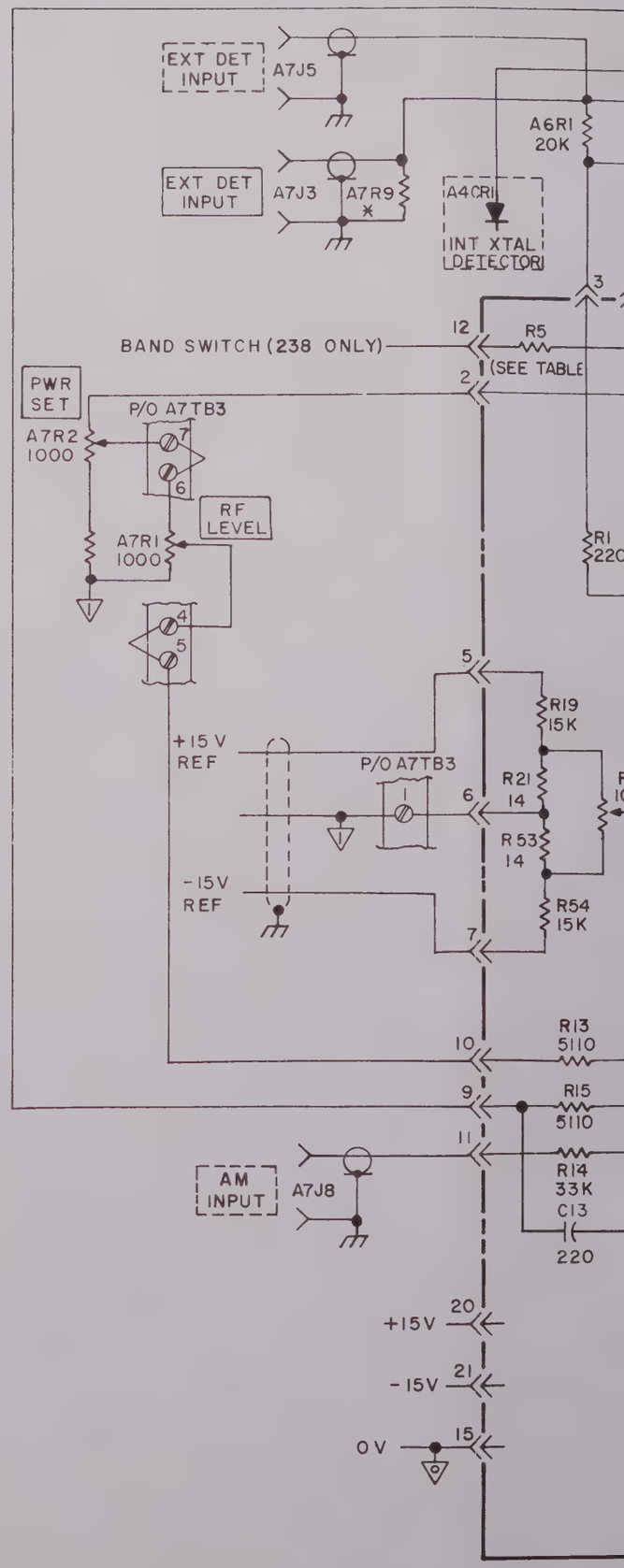
FIG. 8-3

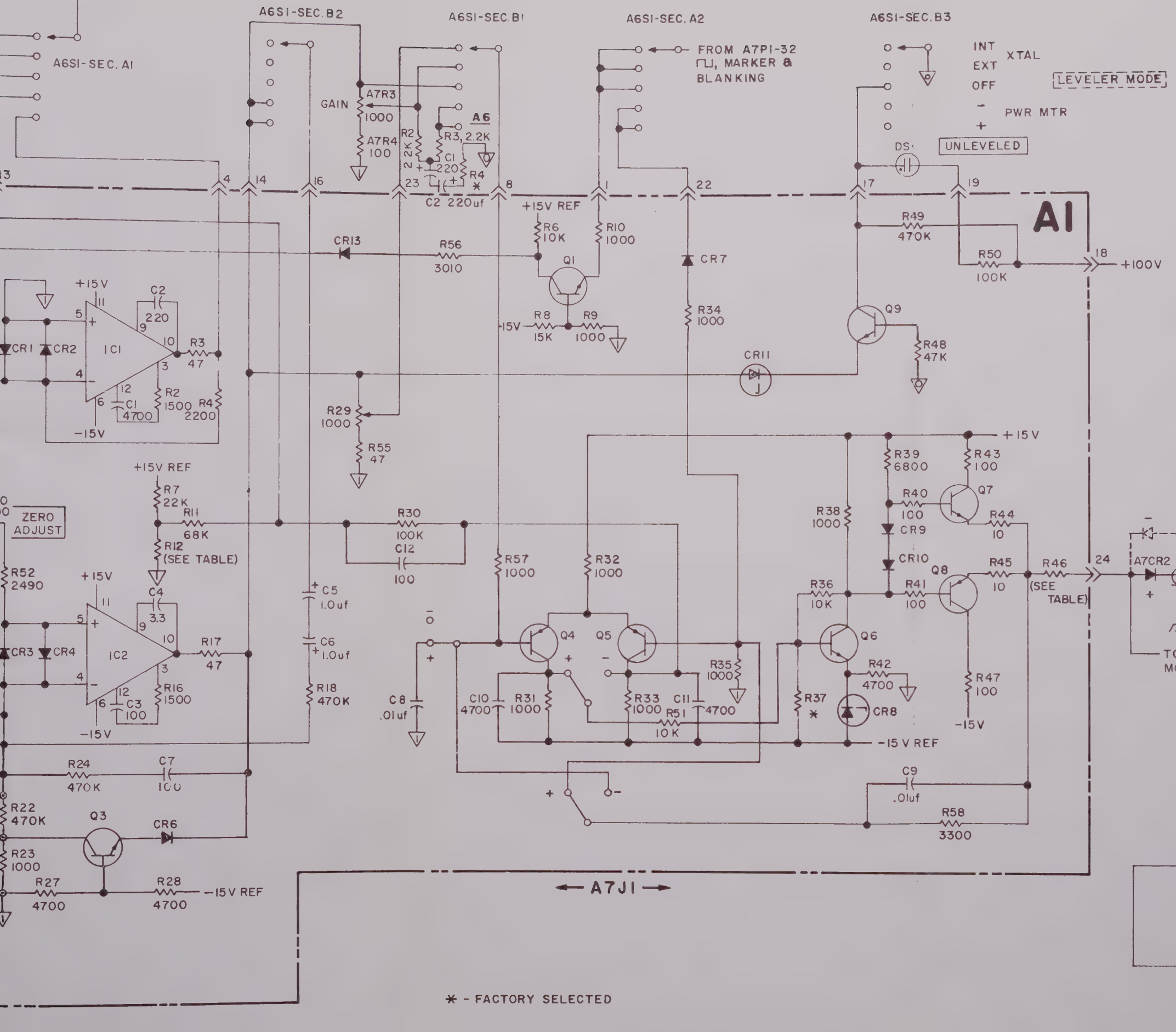
LEVELER
TYPE A

TABLE			
MODEL NO.	AIR5	AIR12	AIR46
231A			
232A			
233A			
234A			
235A			
238A		315-014 3480	300-330 33
238B		315-014 3480	300-330 33
241A			
242A			
243A			
244A			



A1 ASSEMBLY



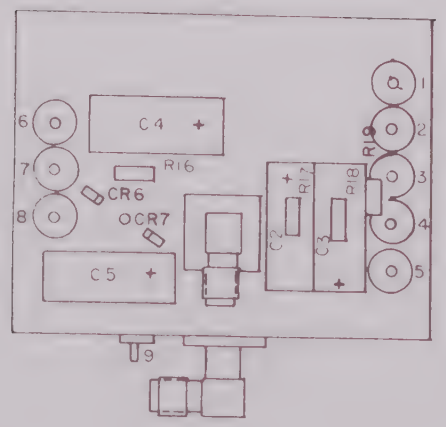


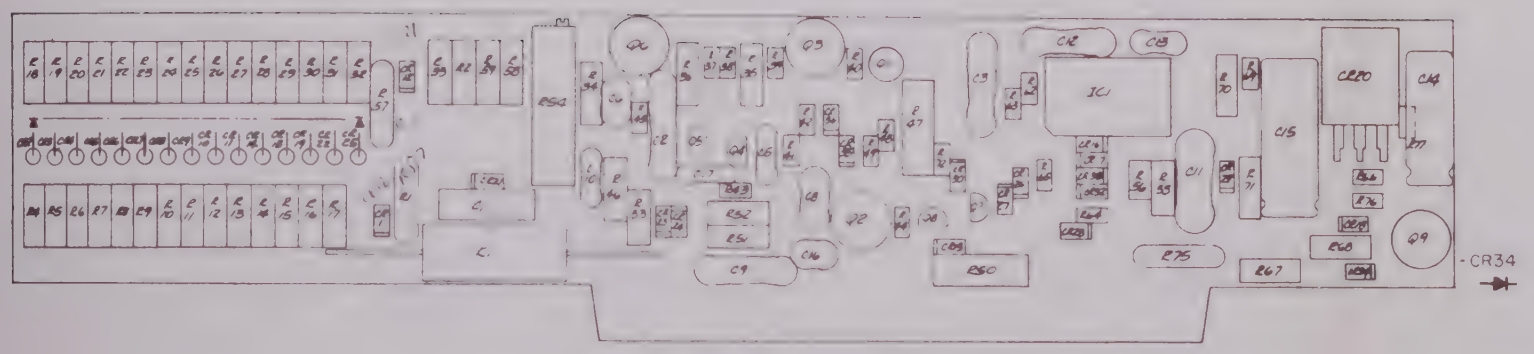
* - FACTORY SELECTED

FIG. 8-4

LEVELER TYPE B

A4A1 ASSEMBLY





A2 ASSEMBLY

115 VAC	1	NC
115 VAC	2	NC
CHASSIS	3	
UNREGULATED INPUT TO BIAS SUPPLY (-)	4	
UNREGULATED INPUT TO BIAS SUPPLY (+)	5	
P/O REGULATED NEGATIVE BIAS SUPPLY RETURN	6	TO A7J2-10
P/O REGULATED NEGATIVE BIAS SUPPLY CONTROL	7	TO A7J2-11
M (CW & SYM) PRESET SELECT	8	NC
NC	9	NC
NC	10	NC
NC	11	NC
NC	12	NC
NULL	13	TO A5S1-SEC. A - ARM
OUTPUT	14	TO A5S1-SEC B
NULL	15	
OUTPUT	16	
	17	TO A7J2-8
TUNING VOLTAGE	18	TO A7J2-3
UNREGULATED 200V SUPPLY (-)	19	TO A7J2-16
UNREGULATED 200V SUPPLY (+)	20	TO A7J2-18
H.V. PREREGULATOR COLLECTOR	21	
H.V. PREREGULATOR DRIVE INPUT	22	TO A7J2-14
H.V. PREREGULATOR LOAD POSITIVE TERMINAL	23	
UNREGULATED INPUT TO YIG SUPPLY (+)	24	TO A7Q2-C
UNREGULATED INPUT TO YIG SUPPLY (-)	25	TO A4J3-4
UNREGULATED 100V SUPPLY	26	TO A7J1-18
BLANKING	27	NC
SWEEP RESPONSE TIME CONTROL	28	TO A7J2-1
	29	TO A7J1-15
+15V REGULATED	30	TO A7J2-5
-15V REGULATED	31	TO A7J2-6
MARKER, ⊔⊓, BLANKING	32	TO A6S1-SEC. A2 - ARM
SWEEP HESITATION	33	
	34	TO A7J2-12
+15V REFERENCE	35	TO A7J2-20
-15V REFERENCE	36	TO A7J2-19

A8J8 BASIC UNIT | A7P1 R F UNIT

A7R7 69.8K PROPORTIONAL SWEEP RESISTOR

SYMMETR SWEEP W

FROM A7P1-13

A5S1 SEC.A

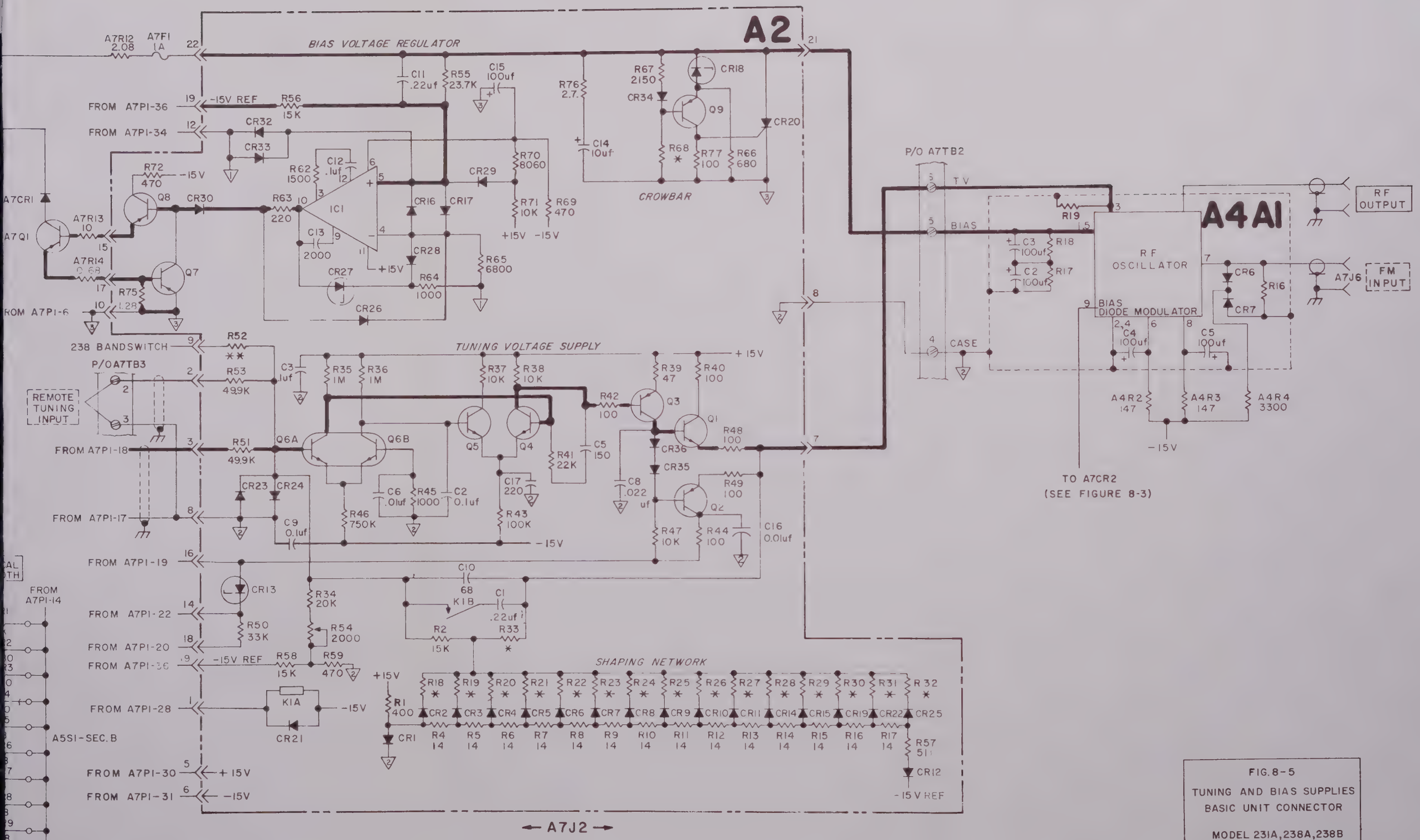
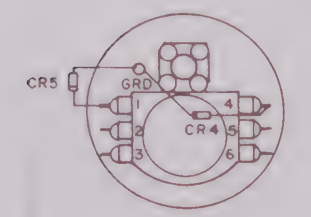


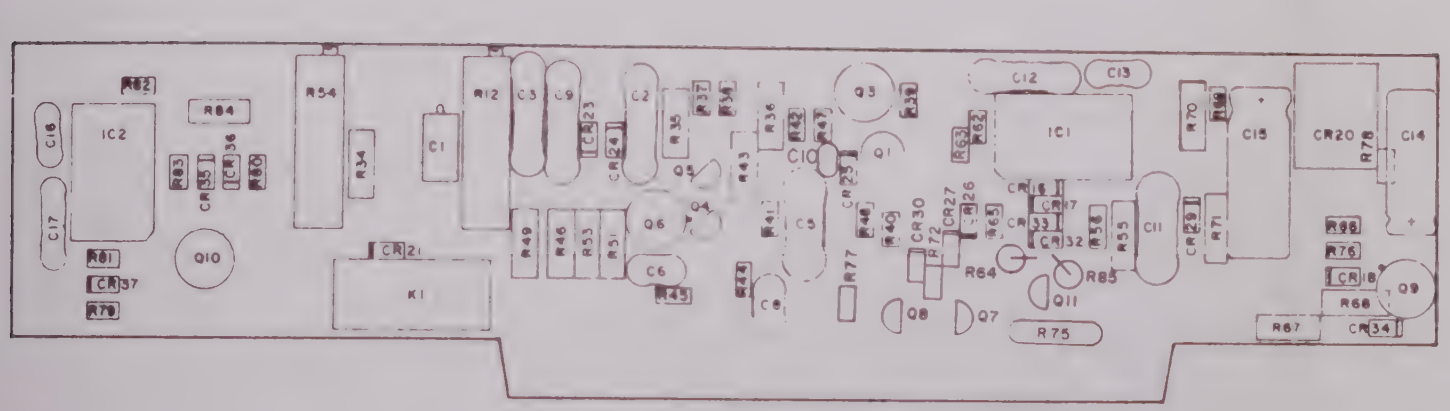
FIG. 8-5
TUNING AND BIAS SUPPLIES
BASIC UNIT CONNECTOR

MODEL 231A, 238A, 238B

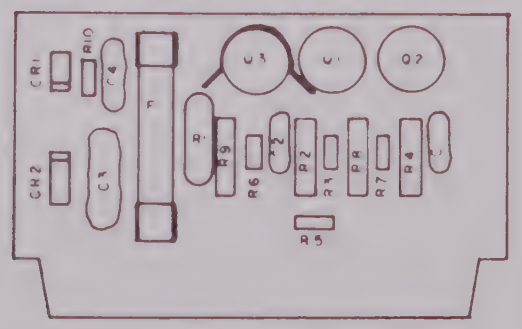
* - FACTORY SELECTED
** - 238A,B ONLY

A4A1 ASSEMBLY

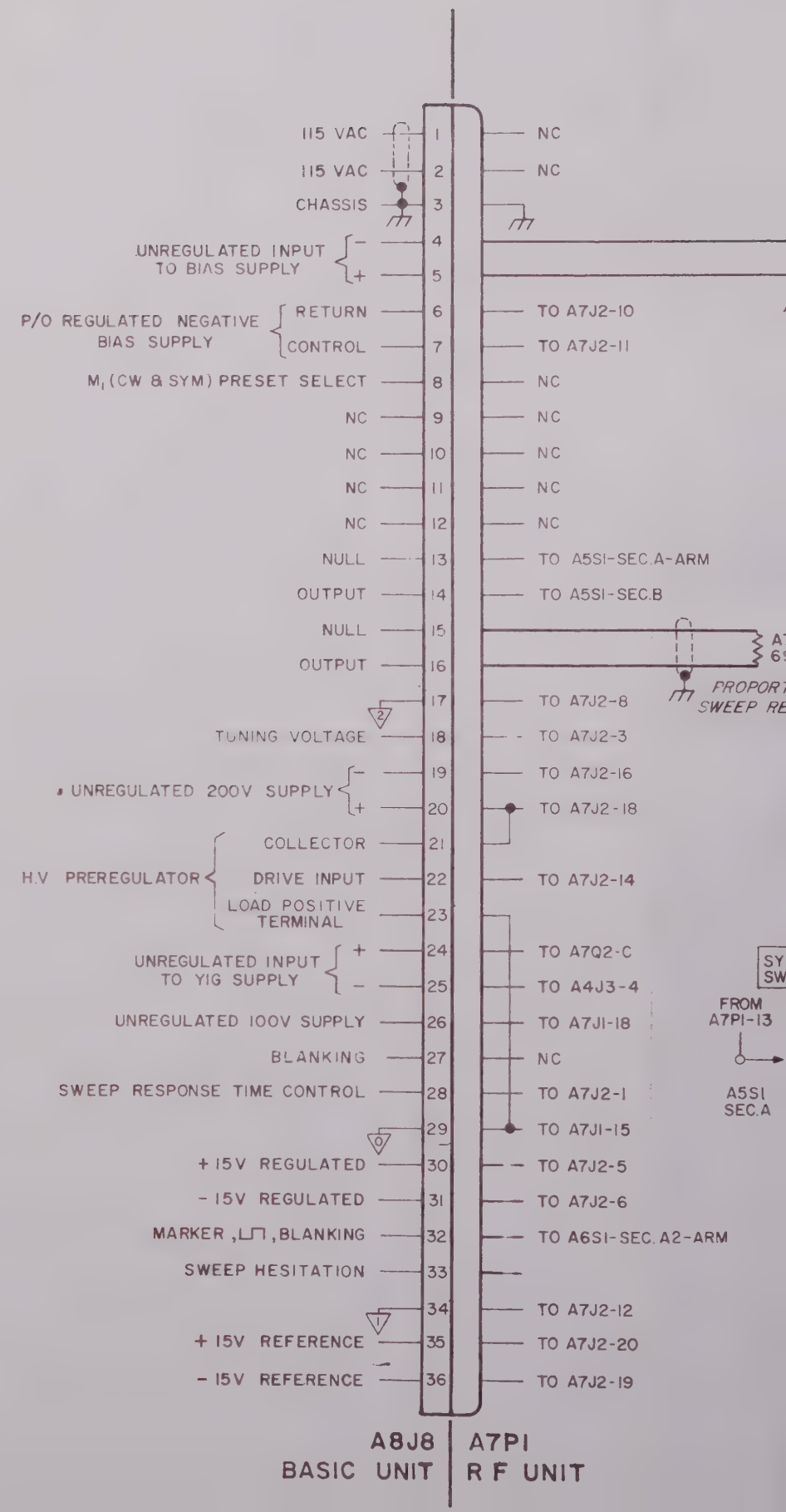


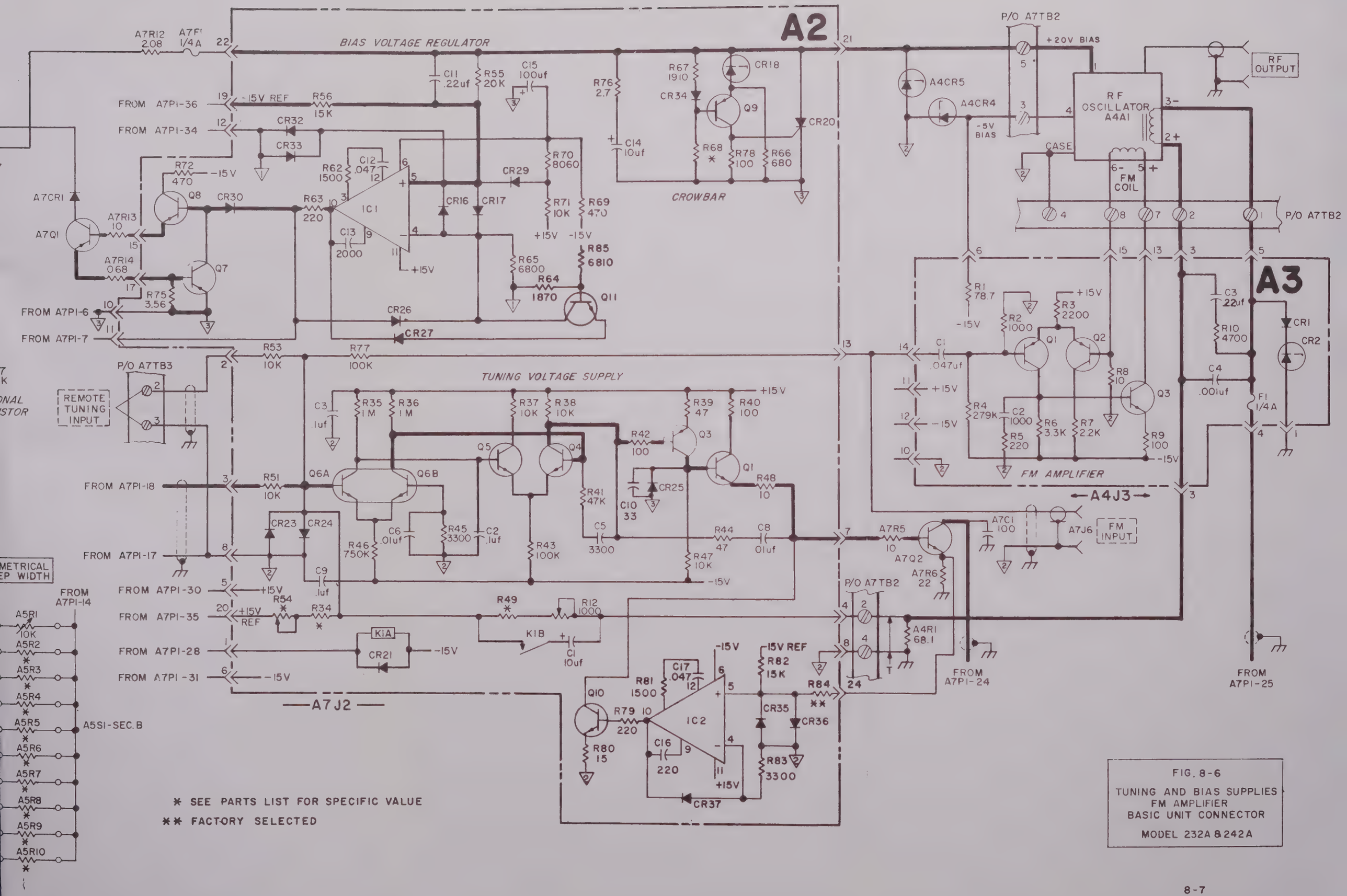


A2 ASSEMBLY



A3 ASSEMBLY





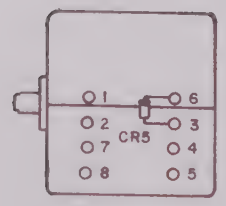
* SEE PARTS LIST FOR SPECIFIC VALUE

** FACTORY SELECTED

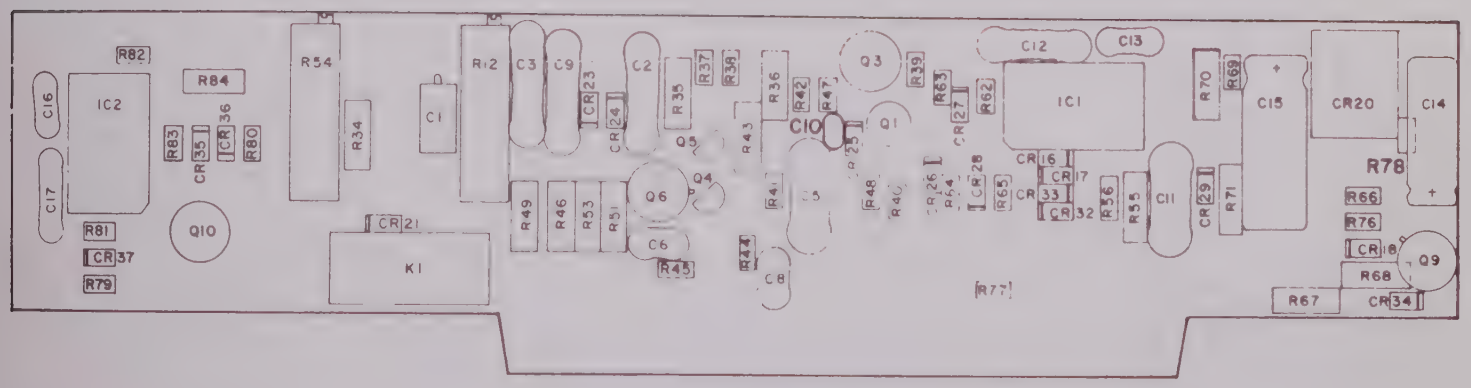
FIG. 8-6

TUNING AND BIAS SUPPLIES
FM AMPLIFIER
BASIC UNIT CONNECTOR

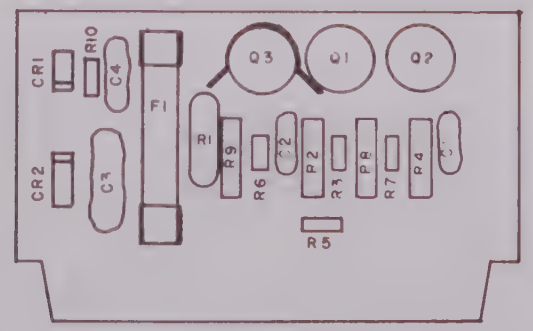
MODEL 232A & 242A



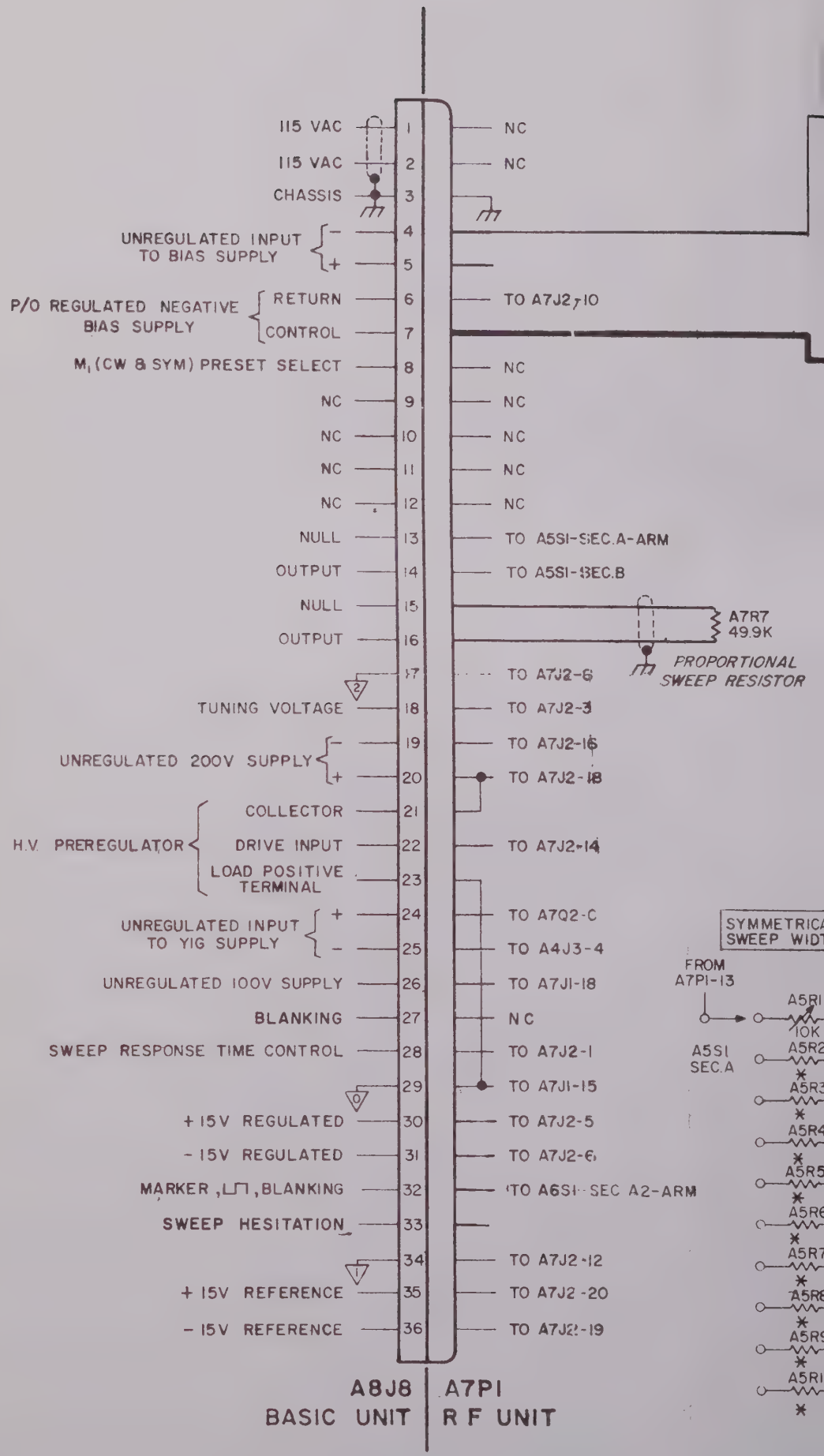
A4A1 ASSEMBLY



A2 ASSEMBLY



A3 ASSEMBLY



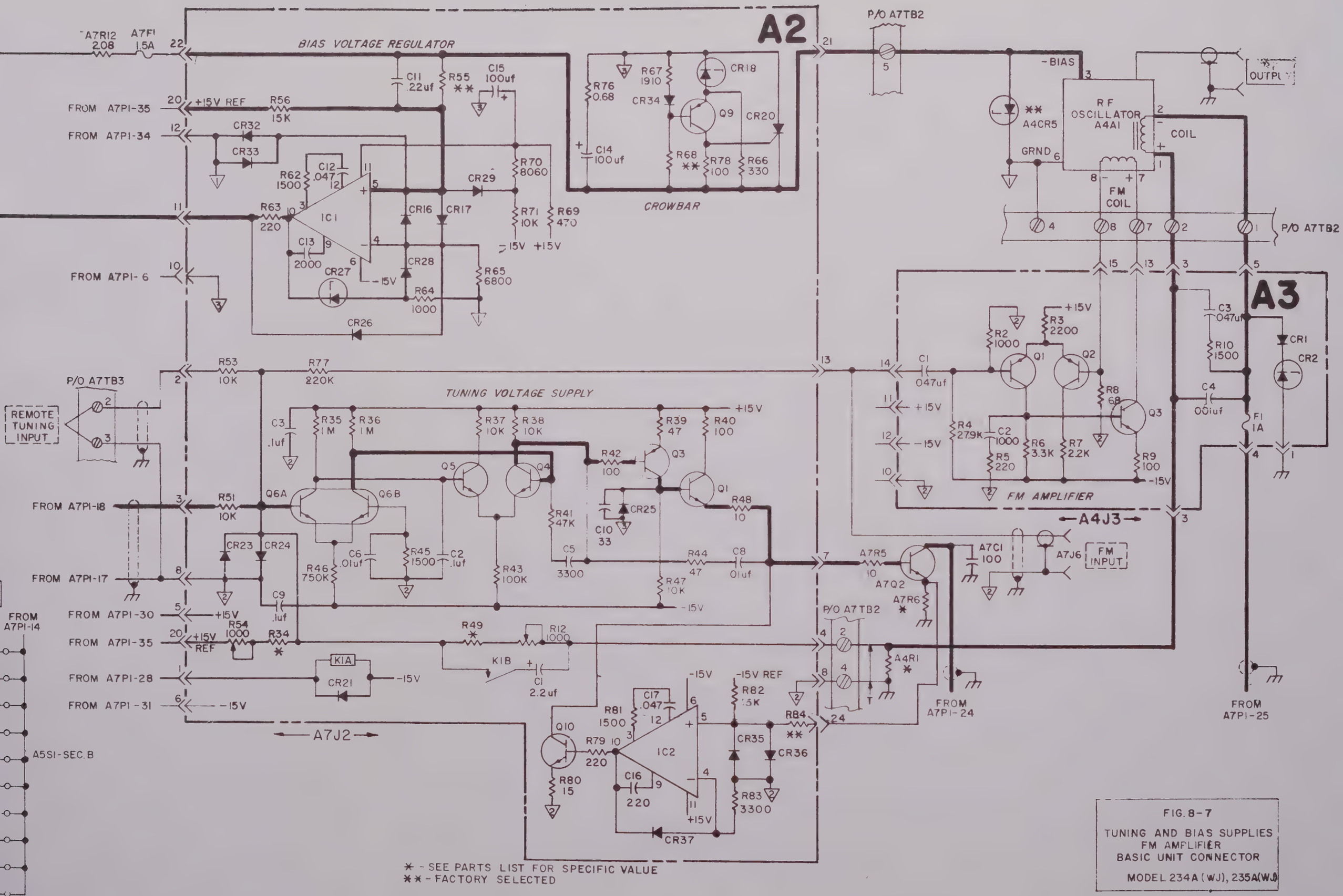
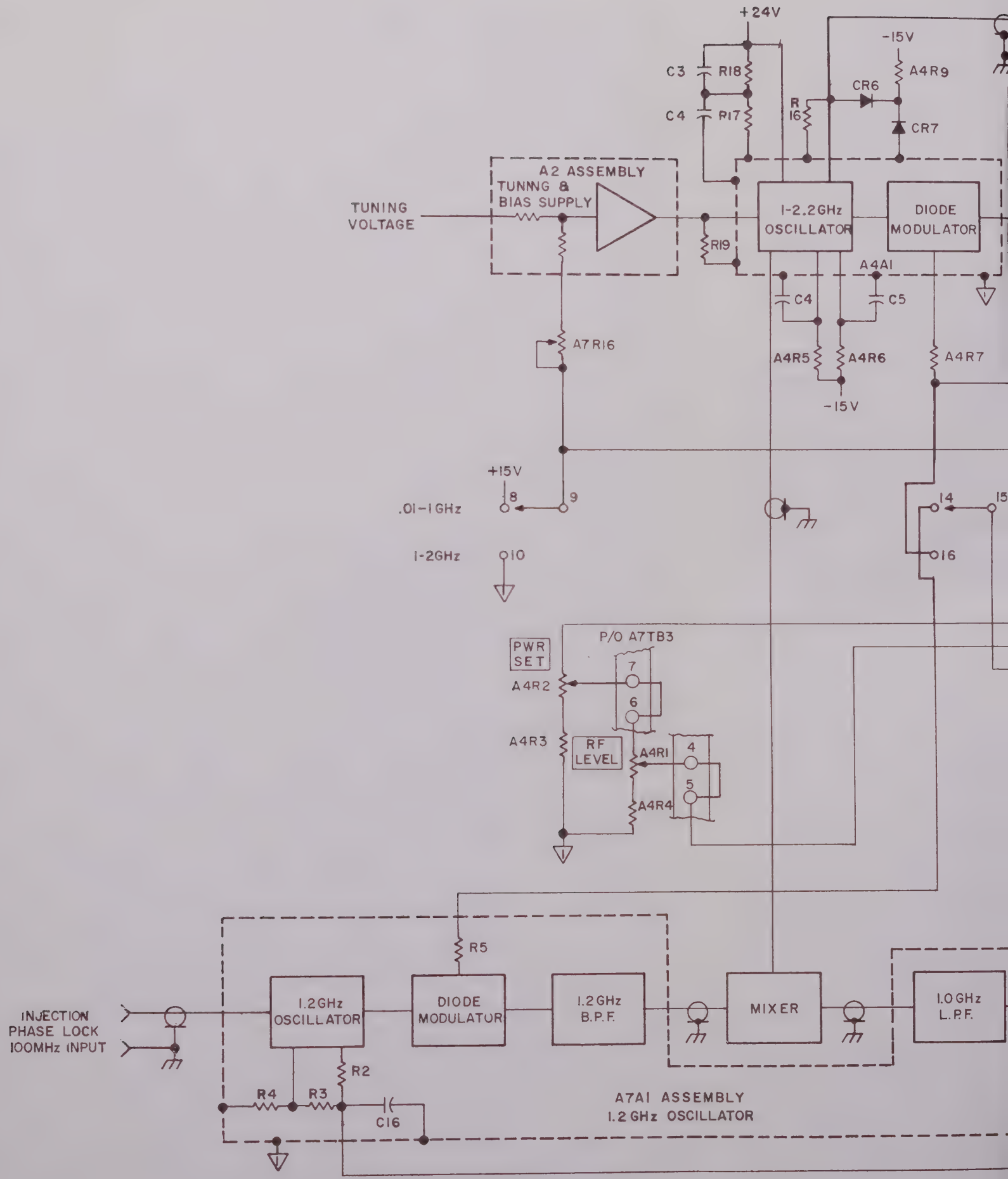


FIG. 8-7

TUNING AND BIAS SUPPLIES
FM AMPLIFIER
BASIC UNIT CONNECTOR

MODEL 234A (WJ), 235A(WJ)


+24V
-15V
C3
R18
C4
R17
R16
CR6
A4R9
CR7
A2 ASSEMBLY
TUNING &
BIAS SUPPLY
TUNING
VOLTAGE
R19
1-2.2GHz
OSCILLATOR
DIODE
MODULATOR
A4A1
C4
C5
A7R16
A4R5
A4R6
A4R7
-15V
+15V
.01-1GHz
8
9
14
1-2GHz
10
16
P/O A7TB3
PWR
SET
A4R2
7
6
A4R3
RF
LEVEL
A4R1
4
5
A4R4
R5
INJECTION
PHASE LOCK
100MHz INPUT
1.2GHz
OSCILLATOR
DIODE
MODULATOR
1.2GHz
B.P.F.
MIXER
1.0GHz
L.P.F.
R2
R4
R3
C16
A7A1 ASSEMBLY
1.2GHz OSCILLATOR

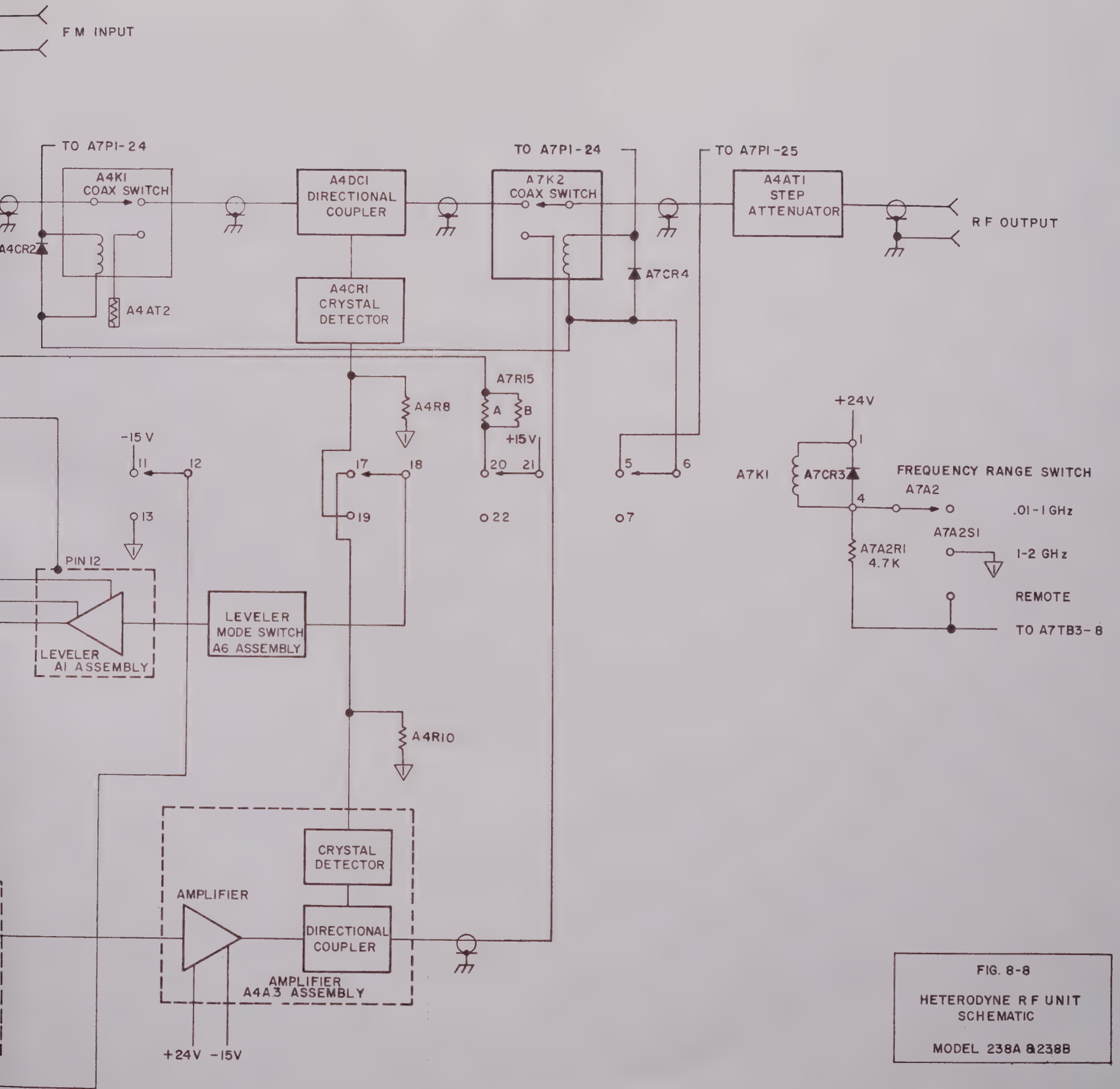
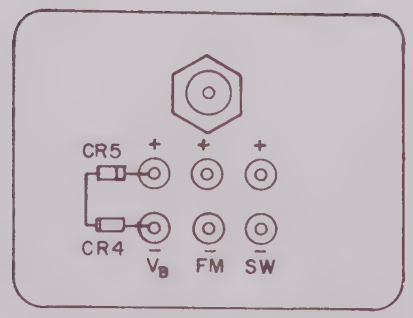


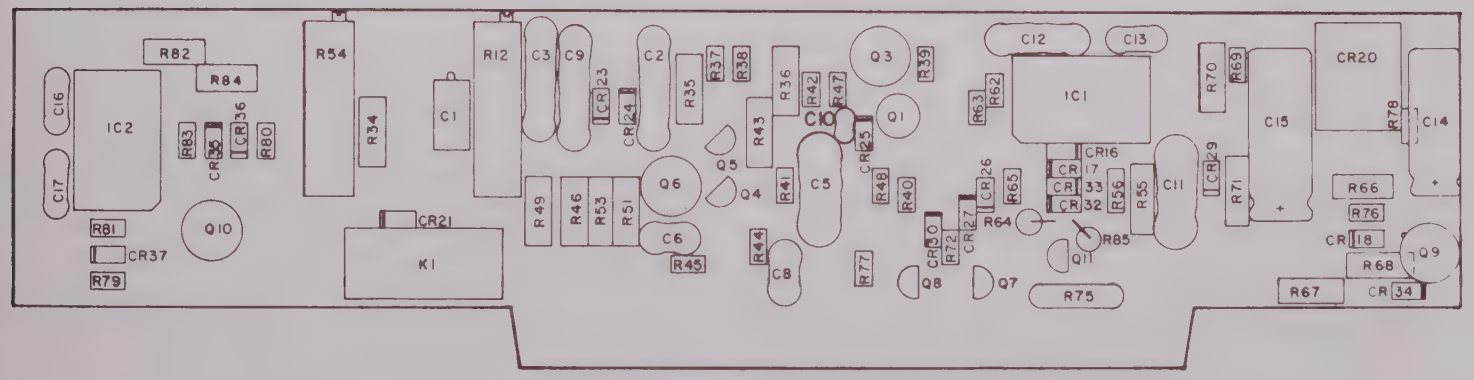
FIG. 8-8

HETERODYNE RF UNIT
SCHEMATIC

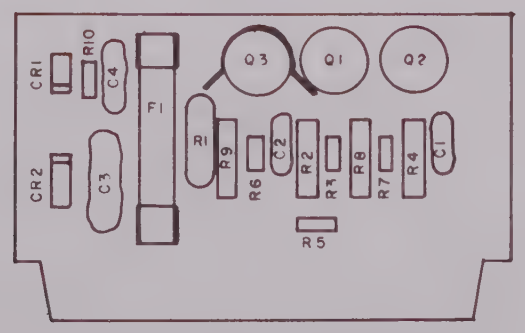
MODEL 238A & 238B



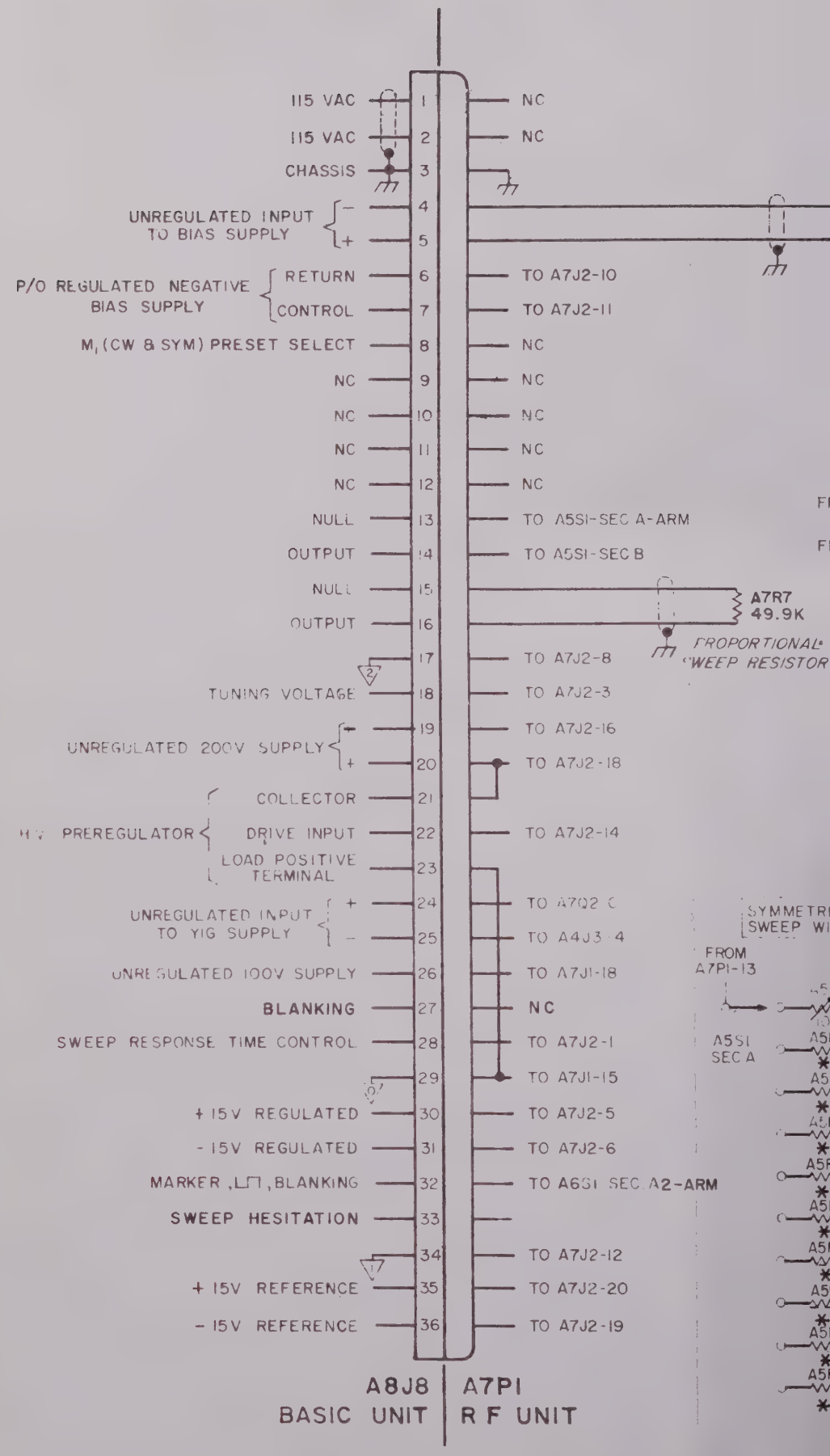
A4A1 ASSEMBLY



A2 ASSEMBLY



A3 ASSEMBLY



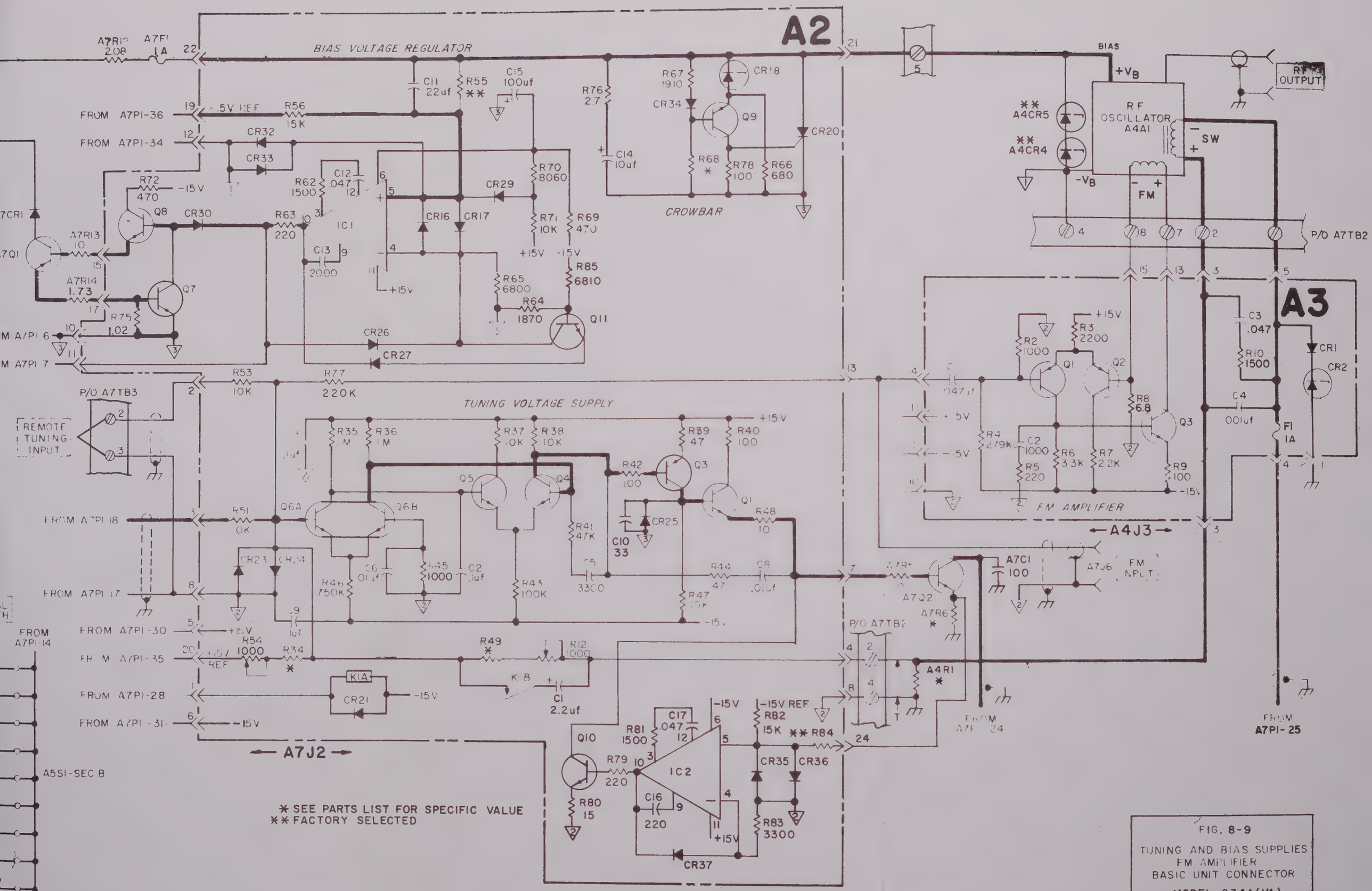


FIG. 8-9

TUNING AND BIAS SUPPLIES
FM AMPLIFIER
BASIC UNIT CONNECTOR

MODEL 234A(VA)
235A(VA)

MICROWAVE OSCILLATOR WARRANTY

The Microwave oscillator installed in the instrument is unconditionally warranted to be free from manufacturing defects for a period of 12 months from date of shipment from Weinschel Engineering Co., Inc. Should the device fail during the warranty period as a result of a manufacturing defect, it may be returned to the factory for repair or replacement at no cost. Oscillators received damaged or with evidence of tampering do not qualify. If an oscillator which has failed during the warranty period is replaced with another one, the replacement unit will be warranted for the balance of the original 12 month period.

Oscillator Return Procedure

No allowance will be made for returned oscillators which are physically damaged upon arrival at the factory. Oscillators should be packed and shipped according to the instructions below. Include with the oscillator a description of the malfunction.

1. Carefully wrap in a 1/4 inch thick "kimpack" cotton batting, or other soft padding material.

2. Wrap the above in heavy kraft paper.

3. Pack in a rigid container large enough to permit at least 4 inches of pack excelsior or similar shock absorbing material to be placed on all sides of the unit. Be certain that the packing is tight all around.

4. Mark the container FRAGILE and ship PREPAID via Air Freight or Railway Express. Do Not ship via Parcel Post or Air Parcel Post.

MICRO-POWER DIVISION
WEINSCHEL ENGINEERING CO.

www.manualsplus.com
1030625